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SUSTAINING ASSOCIATES

A complete listing of the Sustaining Associates of the Society will be found in the Program Section of this issue of the BULLETIN. We are pleased to publish this list and to again call these firms to the attention of our members.

The Chairmen of the *Sustaining Associates Committees* listed on page 3 of the June 1957 BULLETIN are in the process of writing their reports to be presented at Memphis. If the representatives of any of our Sustaining Associates have comments regarding this activity of the Society, we are sure that such comments would be welcomed by the Chairman of either or both Committees.

NOTICE TO AUTHORS

Effective at once in the ANNALS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA and in the JOURNAL OF ECONOMIC ENTOMOLOGY the footnote designating papers for which publication costs are paid will be omitted *unless authors of such papers request that it be included*. This action was approved by the Editorial Boards of the ANNALS and the JOURNAL because there was a feeling in some areas that more financial support for these publications would result if this footnote were omitted. More financial support of these publications by authors or Agencies willing and able to give it will be welcomed. Therefore it seemed desirable to put into effect any change that promises to increase the amount of such financial support.

R. H. NELSON

N. A. C. NEWS

The August, 1957 issue of the *National Agricultural Chemicals News* was devoted to articles on career opportunities in agricultural chemicals. Included among the excellent articles were the following: *Entomology as a Vocational Career*, by President H. M. Armitage; *How I Became an Entomologist*, by M. D. Leonard and *Men for Agricultural Progress*, by S. B. Freeborn. We extend our congratulations to L. S. Hitchner, Executive Secretary of National Agricultural Chemicals Association, and D. L. Miller, Editor of *N.A.C. News*, both members of our Society as well as to members noted above.

AUTOGRAPHA O O

ANNUAL MEETING. This is the Program issue of the BULLETIN. The amount of work, worry and plain Anglo-Saxon sweat that assembling this program caused E. N. Woodbury and his *Program Committee* can well be appreciated. A copy of the program will be available to registrants at Memphis. The Editor would like to see you at the Peabody.

FUTURE MEETINGS. On December 1-4, 1958, we will meet at the Hotel Utah in Salt Lake City and on November 30-December 3, 1959, the place is the Sheraton-Cadillac Hotel in Detroit, Michigan. Future planners take note.

EXHIBITS AT MEMPHIS. Harrold B. Jones and his *Exhibits Committee* are going strong! Both educational and commercial exhibits will be carefully arranged for your edification and enjoyment. Potential commercial exhibitors should remember that the time is growing short.

THROUGH A GLASS, DARKLY. The meter of Emeritus Member E. A. McGregor of Whittier, California, may not disturb either Tennyson or Kilmer but the foresight is that of *Locksley Hall*. Mr. McGregor wrote the following lines for and they are printed in the June 19, 1941 banquet program of the Pacific Branch.

BLITZKREIG FAILS

I think that I shall never see
A bugless weed, or plant, or tree;
With dollars spent most profligate
I spray, I dust, I fumigate,
But in the deadly residue
The pests are worse than hitherto.

ANNUAL REVIEW OF ENTOMOLOGY. Each member of the Society was sent on order blank for Volume 8 of this series. We would very much like to have yours prior to December 1. Our block order sent in after December 1 is a source of income to the Society. While you are filling in this order, how about a copy of INDEX XV? Also an order to Dr. Fisher for a copy of ENTOMA.

BRANCH MEETINGS. The Eastern Branch will meet at the Commodore Hotel in New York on November 25-26. This is the last Branch meeting of 1957. The Cotton States Branch will meet with the parent Society in Memphis, but this is in lieu of their 1958 meeting. The Eastern Branch program looks very interesting. Dr. E. H. Smith and his Program Committee have done a good job. The Editor looks forward to seeing old and new members and to grinding a few Society axes. We should report an enjoyable Pacific Branch meeting in June. Their new officers are listed elsewhere in this issue of the BULLETIN.

MAPS. The Meeting Region and Branch Area maps on the inside back cover may be of interest to the membership. At least we hope so. The numbers refer to meetings of the present Society beginning with the first meeting in Los Angeles in 1953.

KENAGA ARTICLE. The article by E. E. Kenaga, *Commercial and Experimental Organic Insecticides*, in the June 1957 BULLETIN has attracted considerable attention. Reprints in lots of 10 or more can be obtained from the Washington office at 30 cents per copy.

EXHIBITS INFORMATION

Memphis meeting December 2-5, 1957. Write Harrold B. Jones, 2772 Natchez Lane, Memphis, Tennessee.

LELAND OSSIAN HOWARD CENTENNIAL¹ 1857—1957

By FRED CORRY BISHOPP

This is a happy occasion—this gathering to celebrate the 100th anniversary of the birth of a great scientist, a great entomologist, a great man—Doctor Leland Ossian Howard.

Through the years of a long and busy life his contributions to science and humanity were many and outstanding. His work benefited all mankind and had an immediate and long lasting effect on the field of science he most loved—entomology.

I am pleased and honored to be invited to participate in this evening's program.

It was my good fortune to be numbered among the friends of Dr. Howard and to be associated with him officially for many years.

I often recall my first meeting with him. This was sometime about mid-December 1904. While serving as one of the judges at a big apple show in Baltimore, I was asked by Dr. A. L. Quaintance, who was building a small staff to study the cotton bollworm, how I would like to go to Texas on that investigation. When told that I would consider it seriously, Dr. Quaintance said he would like me to come in from the Maryland Agricultural College, where I was employed as assistant entomologist, and meet the Chief of the Bureau of Entomology—Dr. Howard. A few days later Dr. Quaintance took me to Dr. Howard's office in the little red brick building then located near the site of the present marble Administration Building of the Department of Agriculture.

We found Dr. Howard behind his rolltop desk, among piles of books, pamphlets, and papers, busy but not too busy to have a pleasant talk with this very green 20-year-old entomologist. He asked a number of questions, quickly sized me up, and told Dr. Quaintance to offer me the \$1200 a year salary they were going to pay the young entomologists being employed to study the pests then menacing the cotton crop. That was a big salary at the time, and it didn't take me long to accept.

I had several pleasant talks with Dr. Howard before I took off for Texas a couple of months later. These included much sound advice from the Chief and caused me to look forward eagerly to the research and demonstration work ahead.

Through Dr. Howard's years of service he lent good advice, encouragement, and enthusiasm to hundreds of young men. He never encouraged men to undertake entomology as a life work unless they were deeply interested in biology.

One hundred years ago today, that is June 11, 1857, Dr. Howard was born in Rockford, Illinois. His parents moved to Ithaca, New York, while he was an infant, and he and his two brothers grew up in that beautiful country. There he had wonderful opportunity to observe birds and collect insects. This he

did when not actually attending Ithaca Academy or a nearby Latin school. He entered Cornell University when only 16 and soon had the good fortune to study entomology under the widely known teacher and writer, Professor J. H. Comstock.

After receiving his B. S. degree in June 1877, he had in mind preparing to teach biology, but faculty friends advised his mother against that and urged that he prepare for a medical career. Accordingly, in his postgraduate year he took courses pointing in that direction. Dr. Howard's father had died in 1873, and funds did not permit the young man to continue for a medical degree.

On November 13, 1878, an unexcelled opportunity came to Dr. Howard, who was then only 21 years of age. On that date he began work in the U. S. Department of Agriculture as assistant to the prominent entomologist, Dr. C. V. Riley, who had recently become head of the entomological work in the Department.

Young Howard had met Riley and heard lectures given by him at Cornell and had been well recommended by Prof. Comstock. Dr. Howard was essentially a clerk and messenger during the first few years of service under Riley. However, he helped in the preparation of material for publication in official bulletins, *Insect Life*, and the Entomological Commission Reports.

In 1879 Dr. Riley resigned to push the work of the Entomological Commission, and Prof. Comstock headed the work in the Department. During the two years Prof. Comstock served in this capacity, Dr. Howard had intimate association with him and Mrs. Comstock, who was an artist as well as an entomologist.

Dr. Riley again resumed the head of the entomological work of the Department in 1881 and continued in that capacity until 1894. During this period Dr. Howard, as assistant to Dr. Riley, aided in the preparation of many scientific notes and articles, but as was the custom then they appeared mainly under the Chief's name. The first issue of *Insect Life* was thus signed whereas numbers 2 to 6 were under the editorship of Riley and Howard.

In May 1894, J. Sterling Morton, then Secretary of Agriculture, appointed Dr. Howard Chief of the Division of Entomology, since Dr. Riley had resigned. Dr. Howard continued to serve the country and to lead the science of entomology until October 17, 1927, when he was in his 70th year. He was so highly regarded that the Secretary of Agriculture retained him as consultant four years beyond the required retirement age.

¹ Address of the evening, presented at the Howard Centennial Dinner at the Cosmos Club, Washington, D. C., June 11, 1957.

The tremendous growth of the Bureau of Entomology under Dr. Howard's leadership is indicated by the increase in personnel from nine in 1894 to 750 when he retired as Chief, and in appropriations from \$30,000 to \$3,000,000. The tremendous losses inflicted by native pests and the appearance of one devastating foreign pest after another made expansion of entomological work necessary, but there is no question that Dr. Howard's effective leadership and his popular appeal in writings and lectures and the accomplishment of his field force had much to do with this rapid expansion.

The ease with which Dr. Howard wrote and his appealing and interesting presentation of technical and practical problems gave opportunity to develop a large and enthusiastic following. His writings were widely used in schools and colleges. They were consulted and quoted by manufacturers, merchants, bankers, lawyers, and agriculturists as well as by scientists and public health workers. He contributed approximately 1,050 publications on all phases of entomology and related subjects. Many of these were in official publications of the Department of Agriculture, including bulletins, the Yearbook, the Annual Report of the Chief of Bureau, and agricultural journals in the United States and many foreign countries.

Among the larger and more important works were *The Insect Book* (1901), *Mosquitoes, How They Live, How They Are Classified, and How They May Be Destroyed* (1901), *House Fly—Disease Carrier* (1911), *Mosquitoes of North America* (Howard, Dyar and Knab, 4 vols. 1912-17), *A History of Applied Entomology* (1930), *The Insect Menace* (1931), and *Fighting the Insects—The Story of an Entomologist* (1933).

Dr. Howard's writings covering a multitude of subjects included observations and the results of experiments carried out by himself. Of course as his entomological family grew, volumes of information came in from the field and he was a past master at digesting the reports and in presenting the essence of the findings to scientific gatherings and the public. It is remarkable how many articles and books could be turned out by one carrying an administrative load and taxonomic and other important work. Each new pest gaining entrance to the country or discovery of a new control method was the basis of a series of important contributions. Such subjects as the discovery of the use of hydrocyanic acid gas by Coquillett, the San Jose scale, the gypsy and brown-tail moths, and the boll weevil received his serious attention as did also parasite introduction and numerous native pests including flies and mosquitoes.

Dr. Howard loved to attend international meetings and did not miss opportunities to do so. These were not always highly technical and were often attended by political dignitaries and leaders of society. One of these was the International Congress of Agriculture held in Vienna in 1907 at which a colorful reception was held in the beautiful palace of the Emperor, where Dr. Howard was greeted by Emperor Franz Josef. Another was the celebration of the 100th anniversary of the birth of Charles Darwin in Cambridge, England, in 1908. This was preceded by a month by the competitive "Fête Lamarek" in Paris. Another of these great gatherings of scientific men from the world over that Dr. Howard attended as a delegate of the Washington Academy of Science was the celebration in July 1912 of the 250th anniversary of the Royal Society of London. This organization is the oldest scientific society in England and one of the oldest in the world.

Attending meetings was by no means the principal object of Dr. Howard's numerous and extended foreign trips. However, the friendships developed among scores of scientific men and the knowledge

gained of their work was of great value here in the United States. Furthermore, these contacts definitely fostered good international relations. Of course one of the main objectives of this travel was to make arrangements for the collection and shipment of beneficial insects to help offset the destructiveness of foreign pests that gained entrance to this country. These foreign trips gave Dr. Howard a good knowledge of a number of the serious pests that had recently reached our shores, and discussions of our problems led many prominent scientists to visit this country.

Dr. Howard's foreign work took him to England, France, Spain, Portugal, Belgium, Holland, Italy, Austria, Poland, Russia, and Turkey.

These visits led to wide recognition of the U. S. Department of Agriculture and to the bestowal of many honors on Dr. Howard. These included his election as a Fellow of the Entomological Society of London (1915), member of the Académie d'Agriculture de France (1904), of the Commission International d'Agriculture (1907), the Zoological Society of London (1917), the Entomological Society of Chile (1924), and many others. Numerous medals and awards were also bestowed including the Buffon Medal of the Museum d'Histoire Naturelle, Paris (1909), and the Gold Medal of the Italian Ministry of Agriculture (1912). He was made Officer de l'Ordre du Mérite Agricola of France (1923) and Chevalier de la Légion d'Honneur of France (1925). He was also elected to some twenty-five foreign scientific societies.

In the bestowal of honors foreign groups were by no means alone. The receipt by Dr. Howard of the Capper Award consisting of a gold medal and \$5,000 was especially pleasing to him. It came at the end of his 53 and a half years of service in the U. S. Department of Agriculture. Other honors highly appreciated came during his prime. These included his election in 1900 as a trustee of his beloved university—Cornell, the First Medal Award of the New York Farmers, and the Gold Medal of the Holland Society of New York (1924). Honorary degrees were conferred on him by Georgetown University (Ph. D. 1896), Pittsburgh (L.L.D. 1911), California (L.L.D. 1929), Toronto (D. Sc. 1929), Rutgers, (D. Sc. 1930), and M. D. by George Washington (1911). The latter was based partly on night courses taken at Columbian College years before, but more especially on his work in the field of medical entomology.

In this country he was active in many scientific organizations. For example, he was permanent secretary of the American Association for the Advancement of Science from 1898 to 1920 when he was made president. He helped found the American Association of Economic Entomologists and became its president in 1894, also the Entomological Society of America (president, 1920), and the Entomological Society of Washington. In the last he served three terms as president, 1886-7 and 1923, and was elected honorary president in 1928. For many years he was a member of the Cosmos Club, participated in its management and became president in 1909. He was very fond of the Club and its members and spoke of it as his second home.

A big dinner was given Dr. Howard as he retired. This was in the famous Dolly Madison Mansion on Lafayette Square which was then the home of the Cosmos Club. The demand for places at this dinner was so great that the ladies were crowded out, but they were not to be outdone. They gave him another dinner at which he was the only man.

Following this a letter came from a man whom Dr. Howard did not know—Colonel Charles E. Davis of Honolulu—inviting him to make his planned trip

to France via the western route as the Colonel's guest and to stay with the Colonel in Honolulu as long as possible. This Dr. Howard did and greatly enjoyed the trip. He stayed in Paris about a year with his youngest daughter, Janet, who was then living there. He then returned to this country for a cataract operation which was quite successful and enabled him to continue again his extensive reading. It was a blessing that he enjoyed reading and classical music so much for they and his writing helped him occupy his time and not so seriously miss playing billiards with old friends in the Club. During his later years he became more and more handicapped in getting around owing to a back ailment resulting from an injury sustained during a rough voyage across the Atlantic in 1925.

Dr. Howard's interests were so broad and his enthusiasm so marked that it was difficult to learn what field of entomological work was really his preference. It was evident, however, that he was deeply interested in biological control of insect pests both from the standpoint of the introduction of beneficial forms and in taxonomic studies.

I gained the impression that he did not particularly like administrative work, though as Chief of Bureau he had much of it to do. In the 1900's many of the administrative details were left to his chief clerks, R. S. Clifton and E. B. O'Leary. Later as the staff grew much of the administrative work fell on Drs. C. L. Marlatt, A. L. Quaintance, and W. D. Hunter. The first two were serving as assistant or associate chiefs of the Bureau and rightfully should absorb much of the burdensome administrative and fiscal work which was constantly growing.

I think Dr. Howard's interest in medical entomology was the keenest. Certainly his work in that field was of far-reaching importance to the whole world.

As early as 1898 he began studies of the habits of flies in relation to food. His interest in the carriage of diseases by flies was intensified by the contraction of typhoid fever by his daughter, Lucy, who had been forced by her nurse to eat ice cream after a fly had crawled over it.

For several years Dr. Howard put forth tremendous efforts to make people aware of the dangers of food contamination by flies and to get them to help control flies which were then abundant in Washington and throughout the country. This work got the slogan "swat the fly" known the world over. And the suggestion of the common name "typhoid fly" did much to stimulate fly control campaigns as did the book "*The House Fly—Disease Carrier*."

Dr. Howard's work and writings on mosquitoes began in the early 1890's and continued to the end of his service in the Department. His experience with mosquito control dates back to his boyhood days when he poured kerosene on pools to kill mosquito wigglers. This experience, supplemented by practical use of kerosene at his summer home in the Onteora Club in the Catskill Mountains in New York, was the basis of an article read at the meeting of the American Association for the Advancement of Science in Buffalo, New York, commented on in newspapers, and later published in *Insect Life* in 1892. Oiling operations played an important part in mosquito control, but Dr. Howard continuously urged elimination of breeding places as he always did in fly control. His book on mosquitoes published in 1901 and the monumental four-volume work by Howard, Dyar and Knab published in 1912-17 greatly furthered anti-mosquito work among civil groups and the military.

During the planning and execution of the famous tests by Major Walter Reed of mosquitoes as carriers of yellow fever, the sanitation of the Panama Canal Zone, and the cleaning up of yellow fever in Habana, Dr. Howard was consulted by Surgeon General of

the Army, George E. Sternberg, General Gorgas, J. A. LePrince, and others concerning those monumental undertakings. Contacts with these men and with many others engaged in preventive medicine, such as W. S. Thayer of Johns Hopkins, Battista Grassi and Angelo Celli of Italy, J. S. White and Rupert Blue of the U. S. Public Health Service, C. C. Bass of New Orleans, John B. Smith of New Jersey and Sir Rubert Boyce of Liverpool, helped to develop and continue a determined effort against mosquitoes and the terrible diseases they carry.

The correspondence carried on between Dr. Howard and some of these men, as their work progressed, is most interesting. For example, I quote briefly from a letter written Dr. Howard by Major Walter Reed from Columbia Barracks, Quemados, Cuba on January 13, 1900: "The mosquito theory for the propagation of yellow fever is no longer a theory, but a well established fact. Isn't it enough to make a fellow feel happy? *Anopheles* and *Culex* are a gay old pair! What havoc they have wrought on our species during the last three centuries! But with Howard and kerosene we are going to knock them out!"

Dr. Howard's writings, lectures, and taxonomic work clearly formed a basis upon which was built the worldwide drive to eliminate yellow fever and malaria. These colossal undertakings which are now showing such marked results were not dreamed of even 25 years ago. They have been carried forward admirably by men in Dr. Howard's old Bureau, in the U. S. Public Health Service, International Cooperation Administration, the Armed Forces, the Rockefeller Foundation, the World Health Organization, the Pan American Sanitary Bureau and UNICEF; also in many universities, experiment stations, and state and local organizations around the globe.

Several of the men who have made outstanding contributions in this war against insects are with us tonight, and our hats are off to them.

The people of the world owe a great debt to Dr. Howard and his early associates for the sound information they gathered on insects and their control, for the work they did in getting the public to see the need for control, and in gaining its liberal support.

This is well illustrated by the millions of dollars being spent and the tremendous effort being made to eradicate the main carrier of yellow fever in Latin American Republics under the direction of the Pan-American Sanitary Organization, also by the worldwide effort to eradicate malaria by control of the mosquito carriers. Already several countries have essentially eradicated the yellow fever mosquito. At the end of 1956 malaria had been completely eliminated from five countries or territories including the United States and 90 countries had active malaria control programs underway. Millions of people have thus been freed from this the world's worst disease.

I suggest that we stand for a moment in quiet tribute to the memory of Dr. Leland Ossian Howard, one of the fathers of entomology in the United States.

May we continue to stand in recognition of those men and women who are so effectively carrying forward the campaigns in which he was so vitally interested.

This work is doing much to bring about better international feeling, to provide food, raiment, and shelter for the people of the earth, and to relieve them of the terrible suffering and death from insects that carry disease.

To have their illustrious father recognized by this gathering must be pleasing to his daughters, Miss Lucy and Miss Janet, and grandson, Mr. Howard Payne, whom we are glad to have with us this evening.

We are all pleased to do homage to this great worker for the welfare and happiness of mankind.

DEFINITION OF AN ENTOMOLOGIST¹

By ROGER C. SMITH,
Kansas State College, Manhattan

An entomologist is a person who is properly versed in the science called Entomology which is the study of insects and other classes of the phylum Arthropoda in some or all of their activities or attributes.

Both education and experience are essential to the qualifications of an entomologist. Therefore, the following specifications may be used to determine whether a person is an entomologist:

1. Any person who has completed the requirements for and received the Bachelor's degree from a recognized college with a major in entomology or in some biological science and who has taken graduate work preferably leading to the Master's or Doctor's degree in some phase of entomology, or who in either case has been engaged in acquiring further information, practical applications and skills in this field, who holds or has held a position classified as entomological a part or all of the time since graduation, who has a private working library in his field and is a member of at least one of the National Entomological Societies, or,

2. Any person who does not hold a collegiate degree but because of his accomplishments is recognized by other entomologists as being well versed in the subject or is considered by them to be a specialist in some phase of entomological work because of the publication of scientific papers, membership in one of the National Entomological Societies, possession of a private working library and a continuing interest in publications at least in his specialty, participation in national or regional meetings, whose professional information or advice is sought and who has been vocationally or professionally engaged in some phase of entomological work for at least five years, may be classified and considered to be a *professional entomologist*.

Furthermore, any person who at sometime of his life was acknowledged to be a professional entomologist but who has since become inactive through retirement, change of positions, or for any other cause, but who continues his interest in the subject and maintains his membership in one or more entomological societies is entitled to be classed or known as an entomologist.

MEMBERS IN ARREARS

The Washington Office will shortly send out letters to certain members whose 1956 and 1957 dues are unpaid. A paragraph from this letter is copied here:

"Article IX, Section 1 of the By-Laws of the Constitution of the Society reads as follows:

'Members two years in arrears shall be dropped from the rolls by the Secretary after 20 days notice.'

Much as I regret it I have no choice but to bring this to your attention. May we have a reply stating your wishes on or before....."

The "regret" in the letter is sincere, and the Executive Secretary's signature is not added lightly. Nevertheless, it must be done.

We plan to devote most of the December 1957 issue of the BULLETIN to a membership list. Dropped members will not be included. Should you receive one of these letters, please let us hear from you.

Meaning of the term "Profession"

A "Profession" is a vocation in which the occupational behavior of the participant is governed by a conscious code of ethics, usually formulated by the members of the profession acting collectively and intended to be determined by the needs of service to society in the area covered, and which required for entrance to it, and performance in it, a high level of academic education usually at least a Bachelor's degree or an advanced degree, which provides specialized technical training, and who is engaged in applying it to problems of public import or the use of others.

"Professional" means characteristic of, acceptable to, or conforming with the technical and ethical standards of a profession.

Grades of Entomological Activity

A *professional entomologist* is one who conforms to one of the two definitions previously given and who differs from the next two grades generally in training and experience but particularly breadth of view of the entire field and its relations to other fields of learning.

An *entomological technician* is a person trained or skilled in some phase of entomological activity but who lacks the breadth of education, experience, and understanding of the professional entomologist. Most pest control men or beekeepers are entomological technicians.

The *amateur entomologist* is either a student or beginner in learning or practicing entomological techniques or a person interested in some aspect of this field as an avocation or because of his love of the outdoors or of natural history. While entomological technicians are sub-professional, certain amateurs are professional in training or breadth of view. They are amateurs only in the sense of not being employed in the profession or in the amount of time devoted to the subject.

¹ Suggested by "Definition of a Chemist" adopted by the Council of the American Chemical Society, April 3, 1944, Chemical and Engineering News 22 (8):613, April 25, 1944.

ENTOMOLOGICAL CLUB OF SOUTHERN CALIFORNIA

At the 120th regular meeting of the Entomological Club of Southern California, the following officers were elected: Chairman, Laurence R. Jones; Chairman-elect, Paul DeBach; Secretary-treasurer, Roy E. Campbell. Regular quarterly meetings of the club are held on the first Friday of March, June, September, and December at the Y.M.C.A. in Alhambra, beginning at 10:00 a.m. Anyone interested in entomology is welcome to attend.

WASHINGTON STATE ENTOMOLOGICAL SOCIETY

The sixth meeting of the Washington State Entomological Society was held at the Western Washington Experiment Station at Puyallup on Friday, April 12, 1957. Sixteen members were in attendance. E. P. Breakey was in charge of local arrangements. E. J. Newcomer of Yakima is President, and M. H. Hatch of Seattle is Secretary-Treasurer.

FOREIGN VISITORS AT THE STORED-PRODUCT INSECTS LABORATORY, MANHATTAN, KANS.

By H. H. WALKDEN

The Manhattan Station of the Stored-Product Insects Section, Biological Sciences Branch, Marketing Research Division, Agricultural Marketing Service, U. S. Department of Agriculture, is charged with the research program involving the biology and control of insects attacking stored grain and its products. The Station was established as a laboratory of the then Bureau of Entomology in July 1934 under the leadership of Dr. Richard T. Cotton, who continued as leader until October 1951. At that time he was made Section Leader and the writer was designated as Station Leader.

With the initiation of the several foreign aid programs, many foreign students and workers were brought to the United States for training in subjects of interest to them. Many of these visitors were greatly interested in the stored-grain insect problems of their own countries and naturally were desirous of visiting research organizations investigating similar problems in the United States.

Accordingly, many individuals have visited the Station since 1951, their stay ranging from a few hours to a year or more.

The entire staff of the Manhattan Station has participated in the training programs offered our foreign visitors. Every effort has been made to provide programs fitted to the needs and desires of the individuals. Even though it was not always possible for the visitor to put the information obtained in this country to immediate use in his own nation, there has been a grand opportunity to build up international goodwill between the United States and the countries represented by these visitors.

During the period January 1, 1952 to June 30,

1957, ninety-two visitors representing twenty-nine countries have visited the Manhattan, Kansas, Station. These countries and the number of visitors are tabulated below:

1. Argentina	1	17. Germany	2
2. Belgium	2	18. Guatemala	1
3. Bolivia	1	19. India	2
4. Brazil	3	20. Iran	1
5. Canada	4	21. Yugoslavia	14
6. China	6	22. Mexico	1
7. Colombia	2	23. Norway	2
8. Costa Rica	2	24. Pakistan	8
9. Cuba	1	25. Philippines	2
10. Denmark	1	26. Portugal	1
11. Ecuador	4	27. South Africa	3
12. Egypt	2	28. Spain	1
13. England	5	29. Turkey	17
14. Greece	1		
15. Finland	1		
16. Formosa	1	Total	92

These visitors return to their native lands with an entirely different conception of the United States. They cease to envision our country as a land flowing with gold and material riches achieved without effort. Rather, they soon come to the realization that we are common people, hard working, industrious, and that our hopes, sorrows, and emotions are quite like their own. To achieve material things equal to ours, they learn that it takes hard work and lots of it. They also return to their native lands with a measure of goodwill which surely will be of some value in molding future thinking of many countries.

N. I. H. GRANT

The Bishop Museum in Honolulu has been awarded a 5-year grant by the National Institutes of Health for work on "South Pacific Insects of Public Health Importance." This will be coordinated with the existing project "Zoogeography on Pacific Insects," supported by the National Science Foundation. On the new project, an entomologist, a field entomologist and two technicians will be employed, one or two additional specialists will be sent in the field each year, and articles on insects of public health importance will be published. It is aimed to build up a major collection of Pacific insects of public health importance accompanied by ecological data, and to arrange taxonomic work thereon.

J. LINSLEY GRESSITT

SPECIMENS FOR STUDY

The Department of Entomology, Kansas State College, Manhattan, has considerable quantities of undetermined insects, as well as named specimens, available to specialists for study. Recent staff additions make prompt shipments possible. Specimens are largely from Kansas, although some collections from other states and foreign countries are represented. The collection is especially rich in species from groups containing economic forms and often contains specimens collected in the early 1900's, including the Knaus beetle collection. An extensive collection of grassland insects, including detailed host plant and ecological data, is also available for study.

HISTORY OF ENTOMOLOGY IN WORLD WAR II

Elsewhere in this issue of the BULLETIN there is a review of this book which was written by Col. E. C. Cushing and published by the Smithsonian Institution. The following is from the Preface of the book:

"The manuscript of this 'History of Entomology in World War II' was prepared under the general direction of a joint advisory committee appointed in 1947 by the president of the then Entomological Society of America and American Association of Economic Entomologists. Committee members were:

Representing the Association:

Edward F. Knipling
Stanley W. Bromley (deceased)

Representing the Society:

Paul W. Oman
Ralph W. Bunn

Individual sections were reviewed by members of the joint committee and David G. Hall, and supplemental information was added to several of them in order to amplify entomological contributions to the war effort. An entirely new chapter VII on the contributions of civilian entomologists to the war effort was written by a later addition to the joint committee, Ralph W. Sherman."

In a large part it is due to the untiring effort of the Society members named above and to subsidization by the Society that this worthwhile book has been published. Members may obtain copies from the Society's Washington Office at \$2.00 each, post-paid.

OUR MONEY'S WORTH

We are all acutely aware of the increased cost of everything, including entomological publications and membership in professional societies. However, we think in terms of dollars, which have lost greatly in buying power. A unit much less subject to depreciation would be the number of hours of work required of the individual to pay for professional society membership and publications. Even this unit is not perfectly stable, since the work week has dropped from 44 or 48 hours in the early years to its present average of 40 hours.

As a basis for a study of this matter, I have used the entrance salary into the entomological service of the U.S.D.A. In 1917, entomologists were initially employed under the title "Scientific Assistant" and paid about \$1200 a year. In 1937 they were called Junior Entomologists and were paid \$2000 a year. At the present time the grade equivalent to that of Junior Entomologist has become virtually extinct and nearly all new employees now enter the service in the GS-7 grade, formerly designated as that of Assistant Entomologist, at \$4525 a year.

Let us assume that a young entomologist wants to accumulate files of both the JOURNAL OF ECONOMIC ENTOMOLOGY and the ANNALS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA. In 1917 he had to belong to two major organizations at a total cost of \$4.50. Entering the service in 1937, he still had to join two organizations, and paid a total of \$8.00 (from which should be deducted 50 cents earmarked for the purchase of Indices, as they appeared). In 1957 this new entrant into the U.S.D.A. has to join one Society, at a cost of \$16.00, if he is to receive both publications. The number of hours' work required for these items has been remarkably consistent. In 1917 he had to work 7.8 hours for his membership in the two major professional societies, which gave him both publications. In 1937 the figure was the same; in 1957 it was 7.3 hours. In other words, our young entomologist now works a half hour less time for all of these services than he did 20 or 40 years ago.

It is certain that present-day U.S.D.A. entomologists in the higher brackets work fewer hours for their publications and membership in major professional organizations than did their counterparts 20 or 40 years ago, although direct comparisons are difficult because of variation in situations. If I am correctly informed about salaries outside the U.S.D.A., entomologists working for many State agencies or for industry pay even less, in hours of work, for professional society membership and publications, than the U.S.D.A. entomologists just discussed in detail.

But there is more to the story. In the publications of the present Society and those of its predecessor organizations, the member is receiving more and more for his money. Judging by estimates of the total number of words involved, or of the number of square inches of printed matter issued, the member who subscribes to both the ANNALS and the JOURNAL, and now receives the BULLETIN, is getting at least three times as much material as he received in 1917, and nearly twice as much as in 1937.

Summing this all up, today's entomologist does less work to pay for his Society membership, ANNALS and JOURNAL, and now the BULLETIN, than ever before and gets nearly twice as much for his investment as he received 20 years ago. The young entomologist just entering the Federal service gets all of these items for a year for less than a day's pay. Those who have advanced to higher positions receive all of this for only two to four hours of their time, and probably work fewer minutes for it now than ever before.

B. A. PORTER

ENTOMOLOGICAL LITERATURE OF USSR AND SOVIET ORBIT COUNTRIES

The Pergamon Institute, a non-profit foundation, of New York and London, mailing address 4-5 Fitzroy Square, London, W-1, of which Captain I. R. Maxwell, M. C. is Director, announces that, along with that of other sciences, it is in a position to furnish to learned Societies, Government Departments, and individual entomologists, translations from Russian to English of publications of the U.S.S.R. and Soviet orbit countries in the field of entomology, at a cost not to exceed \$4.00 for each one thousand Russian words.

A check list, in English, of such publications currently issued in those countries, may be obtained free on request to the Director.

The Institute will also undertake to supply entomologists on request at quoted prices charged at cost, with respect to the countries mentioned (1) detailed and exhaustive bibliographical information on entomological work; (2) evaluation of such work or provide abstracts or resumes; and (3) make available to scientists in those countries reciprocal services in return for their cooperation; and (4) to the Society, for research and reference, books, journals, and articles, or micro-cards or micro-film, if available, covering the past twenty years, including the war years 1939-1945.

The Institute is also interested in hearing from entomologists who are able to translate scientific papers from Russian into English who would be interested in becoming a member of their paid panel of translators.

H. M. ARMITAGE, *President*

OPPORTUNITIES AT THE SCHOOL OF MEDICINE—UNIVERSITY OF PUERTO RICO

The School of Medicine—School of Tropical Medicine, University of Puerto Rico, San Juan, Puerto Rico, is the recipient of a Public Health Service graduate training grant awarded for the purpose of training in Parasitology, Medical Entomology and Clinical Tropical Medicine. These trainees may be graduate students or faculty members anxious to familiarize themselves with tropical conditions.

At present there exist three vacancies under this program with annual stipends depending on qualifications, as follows:

A predoctoral trainee	\$2,000-\$3,000
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An assistant or associate professor with a doctor's degree to accomplish teaching and research in Parasitology and Medical Entomology	\$5,000-\$7,200

Interested persons please write giving the following information:

- 1—Transcripts of all university credits
- 2—A recent photograph
- 3—A statement of previous experiences
- 4—A list of publications
- 5—A statement of the reasons for applying, and future plans
- 6—The stipend acceptable
- 7—Two letters of recommendation from their professors

Send all correspondence to:

Dr. Irving Fox
School of Medicine—School of Tropical Medicine
University of Puerto Rico
San Juan 22, Puerto Rico
(Continued on page 51)

HOTEL PEABODY
MEMPHIS, TENNESSEE
DECEMBER 2-5, 1957



5th
*annual
meeting*

**ENTOMOLOGICAL
SOCIETY
OF AMERICA**



H. M. ARMITAGE
President

FIFTH ANNUAL MEETING
of the
ENTOMOLOGICAL SOCIETY OF AMERICA

Sixty-ninth anniversary of the former American Association of Economic Entomologists
Fifty-second anniversary of the former Entomological Society of America
and

The Thirty Second Annual Meeting of the Cotton States Branch
Entomological Society of America

HOTEL PEABODY, MEMPHIS, TENNESSEE

December 2-5, 1957

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SYNOPSIS OF PROGRAM

Section A	Section B	Section C	Section D	Section E	Section F
		Opening Session—Continental Ballroom			
9:00-11:45 a.m.					
1:30-2:00 p.m.					
Sectional Business Meetings	Room 200	Louis XIV Room	Venetian Room	Georgian Room	Room 209
	Room 200	Louis XIV Room	Venetian Room	Georgian Room	Room 209
2:00-4:30 p.m.	Symposium: The Future of Taxonomy in Entomology	Papers 1-11	Subsection a Invitation Paper Papers 1-8	Papers 1-11	Subsection b Papers 1-10
					Continental Ballroom
4:30-5:30 p.m.					
6:30-8:00 p.m.					
9:00-12:00 m.					
Presentation of Papers	—	Louis XIV Room Papers 12-22	Georgian Room Subsection d Papers 1-11	Venetian Room Papers 12-16 Invitation Paper Papers 17-21	Room 200 Subsection a Symposium: A Balanced Extension Program
					Continental Ballroom Papers 10-23
9:00-11:30 a.m.					
1:30-5:00 p.m.					
7:00-9:30 p.m.					
9:00-12:00 m.					
Presentation of Papers	Room 209 Papers 1-9	Continental Ballroom Symposium: Comparative Physiology of Drugs and Insecticides 9:00-11:00 Business Meeting 11:00-11:30	Georgian Room Subsection c Invitation Papers, Papers 1-4 Business Meeting 11:00-11:30	Room 200 Papers 22-32 Business Meeting 11:30-12:00	Louis XIV Room Subsection a Symposium: Visual Aids 9:00-11:30 Business Meeting 11:30-12:00
					Venetian Room Papers 24-34 9:00-11:30 Business Meeting 11:30-12:00
1:30-3:15 p.m.					
3:15-4:45 p.m.					
4:45-6:00 p.m.					
7:30-10:00 p.m.					
7:30-10:00 p.m.					
Presentation of Papers	—	—	Room 200 Subsection b Papers 1-10	—	Georgian Room Papers 35-45
9:00-12:00 m.					
Presentation of Papers	Venetian Room Subsection a Symposium: Creating Interest in Entomology	Louis XIV Room Papers 23-36	Room 200 Subsection d Papers 12-22	Skyway Papers 33-40	Georgian Room Symposium: Enlisting Public Cooperation in Control Projects
					Continental Ballroom Papers 46-58
1:30-3:30 p.m.					
Presentation of Papers	—	—	Venetian Room Subsection d Papers 23-30	—	Continental Ballroom Papers 59-65

MONDAY, DEC. 2

TUESDAY, DEC. 3

WEDNESDAY, DEC. 4

THURSDAY, DEC. 5

REGISTRATION

Peabody Hotel, Mezzanine Floor, Sunday, December 1, 5-9 p.m., Monday, December 2, 8 a.m.-5 p.m. The Registration desk will also be open each of the remaining days of the meeting for the convenience of members and other registrants.

Registration Fee: Members, \$5.00; Student Members, \$1.00; Non-Members, \$7.50; Members' Wives and invitation non-member speakers, complimentary.

Registration includes a copy of the program, admission to all Society meetings and admission to the complimentary Entomologists' Mixer, 6:30 p.m., Monday, December 2, in the Continental Room.

HOSPITALITY SUITES

It is requested that hospitality suites be closed during scheduled sessions and after 1:00 a.m.

GOVERNING BOARD MEETINGS

An opportunity for interested members of the Society to observe the Governing Board at work has been made possible by President Armitage who says, "Members are not only invited, but encouraged, to see and hear what is going on behind the 'Green Door.' You are welcome at all Board meetings, to the capacity of the visitor space in the Board room. The only restrictions are that no attempt be made by visitors to enter into Board deliberations. Any visitor desiring to comment on any matter under discussion should do so through his Board representa-

tive." Governing Board meeting will be held in the Pompeian Room, Mezzanine Floor at 1:30 p.m. and 8:30 p.m., Saturday, November 30; at 9:30 a.m., 2:00 p.m., and 8:00 p.m. on Sunday, December 1 and at other times to be announced from the rostrum at general sessions during the meetings.

MOTION PICTURES

Members are invited to show motion pictures of current interest during Tuesday morning, December 3 and Wednesday afternoon, December 4, as indicated on the program. Titles and other pertinent information (size, running time, and if sound or color) should be sent to E. N. Woodbury, Chairman, Program Committee, Hercules Powder Company, Research Center, Wilmington, Delaware, before November 10. Titles will be scheduled in a Program Supplement. Film reels should be sent to Dr. H. G. Johnston, Chairman, Local Arrangements Committee, National Cotton Council, P.O. Box 9905, Memphis 12, Tennessee.

EXHIBITS

(Lobby and Mezzanine Floor)

The Exhibits Committee has completed arrangements for a large number of interesting and instructive exhibits which will be on display in the Hotel Peabody Lobby and Mezzanine Floor throughout the meeting. Those having additional exhibits should get in touch with Mr. H. B. Jones, Chairman, Exhibits Committee, 2772 Natchez Lane, Memphis, Tennessee, at once.

SECTION AND SUBSECTION OFFICERS

A. GENERAL ENTOMOLOGY

D. M. DeLong, *Chairman*
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T. H. Hubbell, *Secretary*

Sub-Section a, Teaching

J. H. Roberts, *Chairman*
L. H. Townsend, *Vice-Chairman*
P. C. Stone, *Secretary*

B. PHYSIOLOGY AND TOXICOLOGY

Daniel Ludwig, *Chairman*
A. S. Perry, *Vice-Chairman*
J. M. Grayson, *Secretary*

C. BIOLOGY

G. S. Roussel, *Chairman*
P. B. Dowden, *Vice-Chairman*
F. R. Lawson, *Secretary*

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M. H. Brunson, *Chairman*
H. A. Jaynes, *Secretary*

Sub-Section b, Apiculture

W. E. Dunham, *Chairman*
R. L. Parker, *Secretary*

Sub-Section c, Relations of Insects to Plant Diseases

R. K. Chapman, *Chairman*
R. C. Dickson, *Vice-Chairman*
G. W. Simpson, *Secretary*

Sub-Section d, Ecology and Bionomics

R. L. Rabb, *Chairman*
J. T. Medler, *Vice-Chairman*
G. T. York, *Secretary*

D. MEDICAL AND VETERINARY ENTOMOLOGY

L. E. Rozeboom, *Chairman*
D. R. Johnson, *Vice-Chairman*
D. W. Micks, *Secretary*

E. CONTROL, EXTENSION AND REGULATORY ENTOMOLOGY

G. D. Jones, *Chairman*
N. O. Berry, *Vice-Chairman*
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Harold Gunderson, *Chairman*
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Sub-Section b, Plant Pest Control and Quarantine

G. F. Callaghan, *Chairman*
H. L. Bruer, *Secretary*

F. CHEMICAL CONTROL INVESTIGATIONS

J. E. Fahey, *Chairman*
P. A. Dahm, *Vice-Chairman*
B. C. Dickinson, *Secretary*

DETAILED PROGRAM

Monday Morning, December 2

9:00-11:00 a.m.

Opening Session—Continental Ballroom, H. M. Armitage, President and R. L. Metcalf, President-Elect, Presiding

1. Invocation: Reverend W. Chester Keller, Pastor, Woodland Presbyterian Church, Memphis
2. Welcoming Address: The Honorable Edmund Orgill, Mayor, Memphis
3. Preliminary Announcements
4. Address by the President of the Society, "Man in an Insect World," H. M. Armitage, Sacramento, California

11:00-11:45 a.m.

Preliminary Business Meeting, Entomological Society of America, Continental Ballroom, President H. M. Armitage, Presiding

Monday Afternoon, December 2

1:30-2:00 p.m.

Preliminary Sectional Business Meetings

Section A. General Entomology, Room 200.
Chairman: D. M. DeLong

Section B. Physiology and Toxicology, Louis XIV Room. Chairman: Daniel Ludwig

Section C. Biology, Venetian Room. Chairman: J. S. Roussel

Section D. Medical and Veterinary Entomology, Georgian Room. Chairman: L. E. Rozeboom

Section E. Control, Extension and Regulatory Entomology, Room 209, Chairman: G. D. Jones

Section F. Chemical Control Investigations, Continental Ballroom. Chairman: J. E. Fahey

2:00-4:30 p.m.

Section A. General Entomology, Room 200

Chairman: D. M. DeLong
Secretary: T. H. Hubbell

Symposium: The Future of Taxonomy in Entomology

- a. Taxonomy and Ecology. R. D. Alexander, University of Michigan, Ann Arbor
- b. Taxonomy and Economic Entomology. H. H. Ross, Illinois Natural History Survey, Urbana
- c. Taxonomy and Taxonomists (Amateur and Professional). Alvah Peterson, The Ohio State University, Columbus
- d. Taxonomy and Insect Repositories. R. L. Wenzel, Chicago Natural History Museum
- e. The Future Tools of Taxonomy. J. G. Rozen, Entomology Research Division, Washington, D. C.

2:00-4:30 p.m.

Section B. Physiology and Toxicology, Louis XIV Room

Chairman: Daniel Ludwig
Secretary: J. M. Grayson

*Submitted Papers:**

- 2:00 1. House Fly Bioassay of Gamma BHC in Milk. Frank W. Fisk, and George W. Ware, Ohio State University and Ohio Agricultural Experiment Station, Columbus
- 2:12 2. Excretion of BHC in Milk from Dairy Cows. George W. Ware and Frank W. Fisk, Ohio State University and Ohio Agricultural Experiment Station, Columbus
- 2:24 3. The Synergistic Action of Combinations of Organophosphorus Compounds. Ralph B. March, University of California, Citrus Experiment Station, Riverside
- 2:36 4. Efficiency of Plant Uptake of Di-Syston Following Various Methods of Treatment. H. T. Reynolds, R. L. Metcalf, and Marianne Winton, University of California, Citrus Experiment Station, Riverside
- 2:48 5. Comparative Rates of Metabolism of Di-Syston at Various Temperatures and in Various Species of Plants. R. L. Metcalf, Marianne Winton, and H. T. Reynolds, University of California, Citrus Experiment Station, Riverside
- 3:00 6. Metabolism of Viozene in a Dairy Cow and in Rats. F. W. Plapp and J. E. Casida, University of Wisconsin, Madison
- 3:12 Recess
- 3:24 7. Ion Exchange Chromatography for the Hydrolysis Products of Certain Organophosphorus Insecticides. F. W. Plapp and J. E. Casida, University of Wisconsin, Madison
- 3:36 8. Metabolism and Residues in Cattle Associated with the Antimyiatic Agent, CL 12,880 (O, O-Dimethyl S-[N-methylcarbamoylmethyl] phosphorodithioate). W. C. Dauterman, J. B. Knaak, T. Kowalczyk and J. E. Casida, University of Wisconsin, Madison
- 3:48 9. Significance of Bovine Rumen Organisms in Metabolism of Organophosphorus Insecticides Ingested by Cattle with Particular Reference to Parathion. J. E. Casida, M. K. Ahmed and R. E. Nichols, University of Wisconsin, Madison
- 4:00 10. Metabolism and Residues of Phosdrin Insecticide Fed to Dairy Cattle. P. E. Gatterdam, J. B. Knaak, R. P. Neidermeier and J. E. Casida, University of Wisconsin, Madison
- 4:12 11. *In Vivo* Studies with Organophosphates on Depression and Recovery of Fly Brain Cholinesterase. D. C. Mengle and J. E. Casida, University of Wisconsin, Madison

2:00-4:30 p.m.

Section C. Subsection a, Biological Control, Venetian Room

Chairman: M. H. Brunson
Secretary: H. A. Jaynes

* Abstracts of submitted papers, grouped by Section in which paper will be presented, are given following the detailed program. Numbers assigned to abstracts correspond to the numbers of the paper in the program.

MONDAY AFTERNOON

Invitation Paper:

The Role of Weather, Natural Enemies and Other Factors in the Natural Control of Insect Populations. Paul DeBach, University of California, Riverside

Submitted Papers:

- 2:36 1. Spiders and Predation in Arkansas Cotton Fields. Willard H. Whitcomb and Leon Moore, University of Arkansas, Fayetteville
- 2:48 2. Some Factors Influencing the Predation of *Polistes* Wasps on the Tobacco Hornworm, *Protoparce sexta* (Johan.). R. L. Rabb, North Carolina State College, Raleigh, and F. R. Lawson, Entomology Research Division, Oxford, North Carolina
- 3:00 3. The Effects of Extremes in Temperature on Populations of *Pyrausta nubilalis* (Hbn.) Infected with *Perezia pyraustae* Paillot. John Paul Kramer, Illinois State Natural Survey, Urbana
- 3:12 Recess
- 3:24 4. Ecological Prerequisites for the Establishment of Effective Entomophagous Insects. Stanley E. Flanders, University of California, Riverside
- 3:36 5. Recent Attempts to Establish Sugarcane Borer Parasites in Louisiana. Leon J. Charpentier, Entomology Research Division, Houma, Louisiana
- 3:48 6. Status of Imported Parasites of the Spotted Alfalfa Aphid in California. Robert van den Bosch, University of California, Riverside
- 4:00 7. The Selection of Pest Control Chemicals with Minimum Effect to Natural Enemies. A. W. MacPhee and K. H. Sanford, Science Service Laboratory, Kentville, Nova Scotia
- 4:12 8. The Effects of Woodpeckers on Populations of the Engelmann Spruce Beetle. Fred B. Knight, U. S. Forest Service, Fort Collins, Colorado

2:00-4:30 p.m.—

Section D. Medical and Veterinary Entomology, Georgian Room

Chairman: L. E. Rozeboom
Secretary: D. W. Micks

Submitted Papers:

- 2:00 1. A New Organic Phosphate Effective Against *Hypoderma lineatum* and *H. bovis* when Administered Internally to Cattle. R. I. Hewitt, E. Waletzky and W. P. Johnson, American Cyanamid Company, Pearl River, New York
- 2:12 2. Bayer 21/199 as a Deterrent to Screw-Worm Attack in Sheep. H. M. Brundrett, Entomology Research Division, Kerrville, Texas
- 2:24 3. A Test with Bayer 21/199 for the Control of Cattle Grubs. Owen H. Graham, Entomology Research Division, Kerrville, Texas
- 2:36 4. Bioassay of the Blood from Cattle Treated with American Cyanamid Compound No. 12,880. R. H. Roberts, Entomology Research Division, Kerrville, Texas and R. D. Radeleff, Parasite Research Division, Kerrville, Texas

- 2:48 5. Reproductive Potential and Longevity of Two Isolated Field Populations of Insecticide-Susceptible House Flies. Fred W. Knapp and Herbert Knutson, Kansas State College, Manhattan
- 3:00 6. The Development and Status of Resistance to Organophosphorus Compounds in House Flies in Florida. G. C. Labrecque, H. G. Wilson and J. B. Gahan, Entomology Research Division, Orlando, Florida
- 3:12 Recess
- 3:24 7. Control of Flies on Dairy Animals with Repellents. D. E. Howell, Oklahoma State University, Stillwater
- 3:36 8. House Fly Control Studies on Savannah, Georgia Farms. John W. Kilpatrick and H. F. Schoof, U. S. Public Health Service, Savannah, Georgia
- 3:48 9. Fly Control in Utah Dairy Barns. Louis J. Ogden and John W. Kilpatrick, U. S. Public Health Service, Logan, Utah
- 4:00 10. Control of Biting Flies Attacking Cattle. J. L. Lancaster, Jr., University of Arkansas, Fayetteville
- 4:12 11. Horn Fly Control by the Use of Dusts in Self-Applying Devices. L. T. Hargett and E. C. Turner, Jr., Virginia Polytechnic Institute, Blacksburg

2:00-4:30 p.m.

Section E. Subsection b, Plant Pest Control and Quarantine, Room 209

Chairman: G. F. Callaghan
Secretary: H. L. Bruer

Submitted Papers:

- 2:00 1. The Gypsy Moth Situation in 1957. W. V. O'Dell, Plant Pest Control Division, Albany, New York
- 2:12 2. The Khapra Beetle Program in the United States and Mexico. L. J. Padgett, Plant Pest Control Division, Oakland, California
- 2:24 3. Status of Japanese Beetle in the United States. T. C. Cronin, Plant Pest Control Division, Moorestown, New Jersey
- 2:36 4. Eradication of the Mediterranean Fruit Fly. G. G. Rohwer, Plant Pest Control Division, Lake Alfred, Florida
- 2:48 5. Witchweed—A Parasite on Roots of Corn and Some Grass and Grain Plants. J. W. Kelley, II, Plant Pest Control Division, Raleigh
- 3:00 6. The Establishment of the Soybean Cyst Nematode Identification Laboratory at Memphis, Tennessee. T. J. Lanier, Plant Pest Control Division, Memphis, Tennessee
- 3:12 Recess
- 3:24 7. Spreading Decline of Citrus. J. W. Patton, Plant Pest Control Division, Lake Alfred, Florida
- 3:36 8. Pink Bollworm Control Through the Destruction of Wild Cotton. F. D. Bittner, Plant Pest Control Division, Coral Gables, Florida

MONDAY AFTERNOON AND EVENING—TUESDAY FORENOON

3:48 9. State-Federal Cooperative Control Programs. W. E. Blasingame, Georgia Department of Entomology, Atlanta

4:00 10. Soil and Building Fumigation Treatments with Methyl Bromide to Suppress the Oriental Fruit Moth in the Okanagan Valley, British Columbia. H. A. U. Monro, Science Service Laboratory, London, Ontario

2:00-4:30 p.m.

Section F. Chemical Control Investigations, Continental Ballroom

Chairman: J. E. Fahey

Secretary: B. C. Dickinson

Invitation Paper:

Pesticides and Molecular Structure. S. A. Hall, Entomology Research Division, Beltsville, Maryland

Submitted Papers:

2:24 1. Relative Effectiveness of Dormant and Summer Control of the European Fruit Lecanium on Prune. Edward H. Smith, New York State Agricultural Experiment Station, Geneva

2:36 2. Single Application Sprays for Peach Tree Borer Control. W. D. Wylie, University of Arkansas, Fayetteville

2:48 3. The Peach Tree Borer in South Carolina. T. E. Skelton and J. H. Cochran, Clemson College, Clemson, South Carolina

3:00 4. Poor Control of the Peach Tree Borer in the Fort Valley, Georgia Area from Trunk Sprays, Oliver I. Snapp, Entomology Research Division, Fort Valley, Georgia

3:12 Recess

3:24 5. Value of Tree Trunk Sprays in Killing Codling Moth Larvae. D. W. Hamilton and Jack E. Fahey, Entomology Research Division, Vincennes, Indiana

3:36 6. Field Studies in the Control of Orchard Mites. M. L. Cleveland, Entomology Research Division, Vincennes, Indiana

3:48 7. Problems Associated with the Possible Use of Systemic Insecticides in Cocoa Production. J. W. Bowman and J. E. Casida, University of Wisconsin, Madison

4:00 8. "All-Purpose" Fruit Sprays. Alfred C. Dowdy, Michigan State University, East Lansing

4:12 9. Biological Observations and Chemical Control of Certain Strawberry Insects. R. G. Haines, Michigan State University, East Lansing

4:30-5:30 p.m.

Preliminary Business Meeting, Cotton States Branch, Venetian Room, Chairman Norman Allen, Presiding

6:30-8:00 p.m.

Entomologists' Mixer, Continental Ballroom

Tuesday Morning, December 3

9:00-11:30 a.m.

Section B. Physiology and Toxicology, Louis XIV Room

Chairman: Daniel Ludwig

Secretary: J. M. Grayson

Submitted Papers:

9:00 12. Demonstration of the Competitive Phase of the *In Vivo* Combination of Organophosphate Insecticides and Nerve Acetyl Cholinesterase. D. C. Mengle and J. E. Casida, University of Wisconsin, Madison

9:12 13. Eggs of Floodwater Mosquitoes (Diptera, Culicidae) V. William R. Horsfall, University of Illinois, Urbana, P. T. Lum, Entomology Research Center, Vero Beach, and L. M. Henderson, Oklahoma State University, Stillwater

9:24 14. Eggs of Floodwater Mosquitoes (Diptera, Culicidae) VI. William R. Horsfall, University of Illinois, Urbana, L. M. Henderson, Oklahoma State University, Stillwater, and P. T. Lum, Entomology Research Center, Vero Beach, Florida

9:36 15. Hemocytes in the Wing-veins of the Giant Cockroach, *Blaberus giganteus* (L.) J. W. Arnold, Science Service, Ottawa, Ontario

9:48 16. The Use of the House Fly (*Musca domestica*, L.) as a Screening Agent for Tumor-Inhibiting Agents. Norman Mitlin and Anne M. Barody, Entomology Research Division, Beltsville

10:00 17. The Respiratory Chain in Flight Muscle Mitochondria. Bertram Sacktor, Army Chemical Center, Maryland, and Ronald W. Estabrook, University of Pennsylvania Medical School, Philadelphia

10:12 Recess

10:24 18. Post-Emergence Maturation in Holometabolous Insects - Cryptic Biochemical Changes Attendant Upon the Apparent Completion of Metamorphosis. Morris Rockstein, New York University, College of Medicine, New York

10:36 19. Diapause in the European Corn Borer. William Hanec and Stanley D. Beck, University of Wisconsin, Madison

10:48 20. A Bioassay of Several Inbred Lines of Corn Resistant to the European Corn Borer. B. W. George, Iowa State College, Ames

11:00 21. The Sense of Taste in *Periplaneta americana* and Its Relation to Basic Characteristics of Nerves. Chester C. Roys, Tufts University, Medford, Massachusetts

11:12 22. Loci of the Olfactory End-Organ of *Phormia regina* Meigen. Bartley Block, Pennsylvania State University, University Park

9:00-11:30 a.m.

Section C. Subsection d, Ecology and Bionomics, Georgian Room

Chairman: R. L. Rabb

Secretary: G. T. York

TUESDAY FORENOON

Submitted Papers:

- 9:00 1. Losses Caused by Various Levels of Pink Bollworm Infestations. J. C. Gaines, Texas A. & M. College, College Station
- 9:12 2. Diapause of the Boll Weevil. J. R. Brazzel and L. D. Newsom, Louisiana State University, Baton Rouge
- 9:24 3. Behavior Studies on the Cotton Boll Weevil in Relation to Insecticides. Robert C. Hunter, University of Arkansas, Fayetteville
- 9:36 4. Feeding by Four Species of Fabric Pests on Natural and Synthetic Textiles. Arnold Mallis, A. C. Miller, and R. C. Hill, Gulf Research and Development Company, Pittsburgh, Pennsylvania
- 9:48 5. The Significance of Floral Constancy Among Bees of the Genus *Diadasia* (Anthrophoridae). E. G. Linsley and J. W. MacSwain, University of California, Berkeley
- 10:00 6. Temperature Response by the Seed Corn Maggot. F. E. Strong, University of Wisconsin, Madison
- 10:12 Recess
- 10:24 7. Insect Populations on Sparse and Dense Plant Populations. David Pimentel, Cornell University, Ithaca, New York
- 10:30 8. The Use of Larvaevorid Maggot Drop as a Means of Measuring Spruce Bugworm Populations. James L. Bean, U. S. Forest Service, St. Paul, Minnesota
- 10:48 9. Population Dynamics of *Conoderus falli* Lane as Related to Tuber Injury in Potato Fields of Northern Florida. Dale M. Norris, Jr., Florida Agricultural Experiment Stations, Hastings
- 11:00 10. Effect of Substrate Color on Corn Earworm Moth Oviposition. Lauren D. Anderson and Henry Nakakihara, University of California, Riverside
- 11:12 11. A Study of Factors Involved in Diapause in the Southern Legume Spider Mite, *Petrobia apicalis* (Banks). B. C. Brooking, B. M. Glancey, and H. B. Boudreaux, Louisiana State University, Baton Rouge

9:00-12:00 a.m.

Section D. Medical and Veterinary Entomology, Venetian Room

Chairman: L. E. Rozeboom
Secretary: D. W. Micks

Submitted Papers:

- 9:00 12. The Effect of Residual Barn Sprays on the Control of Horn Flies. E. C. Turner, Jr. and L. T. Hargett, Virginia Polytechnic Institute, Blacksburg
- 9:12 13. Horn Fly Control with Bayer 21/199. Harold G. Alford, Entomology Research Division, Kerrville, Texas
- 9:24 14. The Use of Treatments Containing Methoxychlor Against Biting Flies on Cattle and the Determination of Methoxychlor Residues in Milk. Tien-Hsi Cheng, Donald E. H. Frear, and Henry F. Enos, Jr., The Pennsylvania State University, University Park

- 9:36 15. Arthropod Transmission of Rabbit Papillomatosis. Herbert T. Dalmat, National Institutes of Health, Bethesda, Maryland
- 9:48 16. Arthropods Associated with the Pack Rat, *Neotoma albigula*, in Southeastern Arizona. Frank N. Young, Indiana University, Bloomington
- 10:00 Recess
- 10:12 *Invitation Paper:* Mutations in Mosquitoes. James B. Kitzmiller, University of Illinois, Urbana
- 11:00 17. The Habits of *Loxosceles reclusus* as Related to Necrotic Arachnidism in Man. Curtis W. Wingo, University of Missouri, Columbia
- 11:12 18. Culture Methods for Mass-Rearing of Screw-worm Larvae. A. J. Graham and F. H. Dudley, Entomology Research Division, Orlando, Florida
- 11:24 19. Mechanical Devices for Dispersal of Sterilized Screw-worm Flies from Aircraft. C. N. Husman and A. H. Baumhover, Entomology Research Division, Orlando, Florida
- 11:36 20. Field Observations on the Effects of Releasing Sterile Screw-worms in a 2,000 Square Mile Area in Florida. A. H. Baumhover, C. C. Skipper, and W. D. New, Entomology Research Division, Orlando, Florida
- 11:48 21. Laboratory Tests for Animal Systemic Insecticides. R. O. Drummond, Entomology Research Division, Kerrville, Texas

9:00-11:30 a.m.

Section E: Subsection a, Extension, Room 200

Chairman: Harold Gunderson
Secretary: J. M. Amos

Symposium:

- How to Plan, Conduct and Report a Balanced Extension Program in Entomology, Moderator: Gordon Barnes, University of Arkansas, Fayetteville
- a. Methods of Promoting Interest. A. A. Muka, Cornell University, Ithaca
- b. Training Leaders. W. J. Colberg, North Dakota Agricultural Experiment Station, Fargo
- c. Relationships with Other Extension Specialists. Lyle Goleman, The Ohio State University, Columbus
- d. Evaluation of Results. L. G. Merrill, Rutgers University, New Brunswick, New Jersey
- e. Writing an Annual Report. M. P. Jones, Federal Extension Service, Washington, D. C.

9:00-12:00 a.m.

Section F. Chemical Control Investigations, Continental Ballroom

Chairman: J. E. Fahey
Secretary: B. C. Dickinson

Submitted Papers:

- 9:00 10. Soil Toxicants for the Mexican Fruit Fly. J. G. Shaw and Sanchez R. Manuel, Entomology Research Division, Mexico City

TUESDAY FORENOON AND AFTERNOON, WEDNESDAY FORENOON

- 9:12 11. A Progress Report on Imported Fire Ant Studies in Mississippi. H. B. Green and Ross E. Hutchins, Mississippi Agricultural Experiment Station, State College
- 9:24 12. Onion Maggot Resistance to Chlorinated Hydrocarbon Insecticides. J. F. Doane and R. K. Chapman, University of Wisconsin, Madison
- 9:36 13. Onion Thrips, *Thrips tabaci* Lind., Infesting Cabbage. Dan Wolfenbarger and E. T. Hibbs, Iowa State College, Ames
- 9:48 14. Serpentine Leaf Miner: Brief History and Summary of a Decade of Control Measures for It in South Florida. D. O. Wolfenbarger, Sub-Tropical Experiment Station, Homestead, Florida
- 10:00 15. Onion Maggot Control with Systemic Insecticides. W. A. Rawlins, Cornell University, Ithaca
- 10:12 16. Failure of Soil Insecticides to Control the Southern Potato Wireworm, *Conoderus falli* Lane. Dale M. Norris, Jr., Florida Agricultural Experiment Stations, Hastings
- 10:24 Recess
- 10:36 17. Nantucket Tip Moth Control Studies on Loblolly Pine. William W. Neel, Mississippi Agricultural Experiment Station, State College
- 10:48 18. Control of the European Elm Scale with Systemic Insecticides. R. H. Nagel, Forest Service, Ft. Collins, Colorado
- 11:00 19. Some Recent Developments in White-Pine Weevil Research in the Northeast. H. A. Janes, Forest Insect and Disease Laboratory, New Haven, Connecticut
- 11:12 20. The Occurrence, Distribution, and Control of Bagworms in Ohio. R. B. Neiswander, Ohio Agricultural Experiment Station, Wooster
- 11:24 21. Investigations on Control of the Bronze Birch Borer and the Flatheaded Apple Tree Borer. Robert E. Williams, Ohio Agricultural Experiment Station, Wooster
- 11:36 22. Preliminary Studies on the Use of Systemic Insecticides in Conifers and Elm. R. L. Giese, A. Azawi, D. M. Benjamin and J. E. Casida, University of Wisconsin, Madison
- 11:48 23. The Toxicity of Certain Organic Phosphate Acaricides as Systemics in Chrysanthemum. John T. Schulz, North Dakota Agricultural College, Fargo, and Edwin T. Hibbs, Iowa State College, Ames

9:00-11:30 a.m.

Motion Pictures Skyway

Tuesday Afternoon, December 3

1:30-5:00 p.m.

Invitational Program, Continental Ballroom, Leigh E. Chadwick, Presiding

Insect Behavior

- a. The Neural Basis of Behavior in Insects. K. D. Roeder, Tufts University, Medford, Massachusetts

- b. The Physiology of Feeding Behavior. V. G. Dethier, The Johns Hopkins University, Baltimore, Maryland
- c. Insects and Theories of Behavior. W. G. Van der Kloot, Cornell University, Ithaca, New York
- d. The Ecological Significance of Studies in Insect Behavior. A. C. Hodson, University of Minnesota, Minneapolis

Tuesday Evening, December 3

7:00-9:30 p.m.

Entomologists' Banquet, Continental Ballroom

Wednesday Morning, December 4

9:00-11:00 a.m.

Section A. General Entomology, Room 209

Chairman: D. M. DeLong

Secretary: H. T. Hubbell

Submitted Papers:

- 9:00 1. Evidence of the Occurrence of Sibling Species of Rice Weevils in the Southern United States. E. H. Floyd and L. D. Newsom, Louisiana State University, Baton Rouge
- 9:12 2. Interbreeding Potentials Among Different Populations of *Tetranychus telarius* (L.) and of *T. cinnabarinus* (Bois.) H. Bruce Boudreaux, Louisiana State University, Baton Rouge
- 9:24 3. Host-Parasite Relations of the Mallophaga (Biting Lice) of Pocket Gophers. Ronald A. Ward, Gonzaga University, Spokane, Washington
- 9:36 4. Ecology and Selection in a Polytypic Species of Butterfly. John C. Downey, Southern Illinois University, Carbondale
- 9:48 5. The Tropical Influence in the *Empoasca* Leafhopper fauna of Eastern North America. H. H. Ross, H. B. Cunningham, and G. C. Decker, Illinois Natural History Survey, Urbana
- 10:00 Recess
- 10:12 6. Characters for the Identification of the Female Sex of the Leafhopper genus *Empoasca*. H. H. Ross and H. B. Cunningham, Illinois Natural History Survey, Urbana
- 10:24 7. Notes on Richardiinae (Diptera Acalyptratae: Otitidae) with a Review of the Species Known to Occur in the United States. George C. Steyskal, Grosse Ile, Michigan
- 10:36 8. The Alimentary Canal of the Larval Third-Instar European Chafer, *Amphimallon majalis*, Razoumowsky, (Scarabaeidae) and Its Anatomy and Histology. James H. Menees, Cornell University, Ithaca
- 10:48 9. Mating and Spermatophore Formation in *Pseudaletia unipuncta*. Philip S. Callahan, Louisiana State University, Baton Rouge

WEDNESDAY FORENOON

9:00-11:00 a.m.

Section B. Physiology and Toxicology, Continental Ballroom

Chairman: Daniel Ludwig
Secretary: J. M. Grayson

Symposium:

Comparative Physiology of Drugs, Insecticides, and Other Chemicals

- a. Pathways of Drug Metabolism in Vertebrates. James Gillette, National Heart Institute, Bethesda, Maryland
- b. The Comparative Metabolism of Organophosphorus Insecticides in Plants, Insects, and Mammals. Ralph B. March, University of California, Riverside
- c. Comparative Physiology of Arthropod Toxins. Raimon L. Beard, Connecticut Agricultural Experiment Station, New Haven

9:00-11:00 a.m.

Section C. Subsection c, Relations of Insects to Plant Diseases, Georgian Room

Chairman: R. K. Chapman
Secretary: G. W. Simpson

Invitation Paper:

The Mechanism of Leafhopper Transmission of Plant Viruses. L. M. Black, Department of Botany, University of Illinois, Urbana
Aphid Transmission of Plant Viruses. E. S. Sylvester, University of California, Berkeley

Submitted Papers:

- 10:12 1. Six-Spotted Leafhopper Control in Relation to the Incidence of Purple-Top Wilt of Potatoes. J. K. Knoke and R. K. Chapman, University of Wisconsin, Madison
- 10:24 2. Incidence of Potato Leaf-Roll as Influenced by Aphid Control. W. A. Rawlins and K. H. Fernow, Cornell University, Ithaca
- 10:36 3. Some Insect Injuries Resembling Plant Virus Symptoms. Floyd F. Smith and Phillip Brierley, Entomology Research Division, Beltsville, Maryland
- 10:48 4. Whitefly-Borne Plant Viruses. R. C. Dickson and E. F. Laird, Jr., University of California, Riverside

9:00-11:30 a.m.

Section D. Medical and Veterinary Entomology, Room 200

Chairman: L. E. Rozeboom
Secretary: D. W. Micks

Submitted Papers:

- 9:00 22. Chemical Resistance and Control of the Brown Dog Tick by Contact Insecticides. William Hazeltine, Agricultural Specialties, Dallas, Texas
- 9:12 23. The Effects of Oral Doses of Dow ET-57 on Chicken Shaft Louse Infestations. E. M. Raffensberger, Virginia Agricultural Experimental Station, Blacksburg
- 9:24 24. Korlan as a Larvicide for Fly Control Under Caged Chickens. F. W. Knapp and C. C. Roan, Kansas State College, Manhattan

- 9:36 25. Influence of Black Fly Control Measures on the Incidence of *Leucocytozoon* Disease of Turkeys in South Carolina. Darrell W. Anthony, Entomology Research Division, Kerrville, Texas, and Dale J. Richey, Clemson Agricultural College, Clemson, South Carolina

- 9:48 26. The Rearing and Radioactive Tagging of *Fannia canicularis*. John W. Kilpatrick, Richard W. Fay, and James T. Baker, U. S. Public Health Service, Savannah, Georgia

- 10:00 27. Results of Laboratory Tests on the Toxicity of Several Insecticides to *Chrysops* Larvae. Robert A. Hoffman, Entomology Research Division, Corvallis, Oregon

10:12 Recess

- 10:24 28. A Thermal Trap for Tabanids and Other Diptera. A. J. Thorsteinson, University of Manitoba, Winnipeg, Canada

- 10:36 29. A Report on Haemagogus Mosquitoes in the United States. Osmond P. Breland, The University of Texas, Austin

- 10:48 30. Parthenogenesis in *Aedes aegypti* (L.). George B. Craig, Jr., Army Chemical Center, Maryland

- 11:00 31. Genetic Basis of Larval Pigmentation in *Aedes aegypti* (L.) (Diptera: Culicidae). Nicholas W. Gillham, Fort Detrick, Frederick, Maryland, and George B. Craig, Jr., Army Chemical Center, Maryland

- 11:12 32. A Test for Detecting Dieldrin Tolerance in *Anopheles* Mosquitoes. Jack Colvard Jones, U. S. Public Health Service, Bethesda, Maryland

9:00-11:30 a.m.

Section E. Subsection a, Extension, Louis XIV Room

Chairman: Harold Gunderson
Secretary: J. M. Amos

Symposium:

Preparation and Use of Visual Aids in Entomology. Moderator: Joe Tonkin, Federal Extension Service, Washington, D. C.

- a. Color Slides. J. H. Roney, University of Arizona, Phoenix
- b. Chalk Talks and Flannel Board Presentation. Glen Lehker, Purdue University, Lafayette, Indiana
- c. Charts and Flip Cards. A. C. Bennett, Mississippi State College, State College
- d. Motion Pictures. J. O. Rowell, Virginia Polytechnic Institute, Blacksburg
- e. Your Pet Visual Aid (10 Minute Discussion or Demonstration). Ray Janes, Michigan State College, East Lansing, Robert Every, Oregon State College, Corvallis, and Harold Gunderson, Iowa State College, Ames

9:00-11:30 a.m.

Section F. Chemical Control Investigations, Venetian Room

Chairman: J. E. Fahey
Secretary: B. C. Dickinson

WEDNESDAY FORENOON, AFTERNOON AND EVENING

Submitted Papers:

- 9:00 24. Tedion, An Outstanding New Acaricide. William C. Ferguson, Niagara Chemical Division, Middleport, New York
- 9:12 25. Niagara 1240, A Promising New Acaricide and Insecticide. Berton C. Dickinson, Niagara Chemical Division, Middleport, New York
- 9:24 26. The Effect of Different Rates and Application Dates of Granulated Insecticides in Clover Weevil Control. H. H. Tippins, Georgia Experiment Station, Experiment
- 9:36 27. Residue Studies and the Research Entomologist. T. O. Tuft and R. W. Fogleman, Hazleton Laboratories, Inc., Palo Alto, California
- 9:48 28. Granular Insecticides for Control of Alfalfa Weevil Larvae. H. L. Hansen and C. K. Dorsey, West Virginia University, Morgantown
- 10:00 29. Thiodan Residues on Corn. D. A. Lindquist, M. L. Fairchild, T. A. Brindley, and P. A. Dahm, Iowa State College, Ames
- 10:12 Recess
- 10:24 30. Determination of *N,N*-Diethyltoluamide by Ultraviolet Spectrophotometry. Claude Schmidt, Malcolm Bowman, and Fred Acree, Jr., Entomology Research Division, Orlando, Florida
- 10:36 31. Thimet Residues in Small Grains Grown in Treated Soil. J. H. Lilly, L. Madamba, K. V. Frey, and P. A. Dahm, Iowa State College, Ames
- 10:48 32. Analysis of Foods for DDT and Lindane After Exposure to Insecticidal Fogs. Haig Markarian and Francis J. Kane, Quartermaster Research and Engineering Center, Natick, Massachusetts; and Ben H. Kantack, Agricultural Marketing Service, Savannah, Georgia
- 11:00 33. Bioassay Technique for Analyzing Guthion Residues in Alfalfa. W. O. Pfaffle, J. Gurland, P. A. Dahm, and I. Lee, Iowa State College, Ames
- 11:12 34. Pesticide Residues on Strawberries. Jack E. Fahey, Entomology Research Division, Vincennes, Indiana; J. C. Rodrigues, University of Kentucky, Lexington; Harold W. Rusk, Entomology Research Division, Vincennes, Indiana; and C. E. Chaplin, University of Kentucky, Lexington

11:00-11:30 a.m.

Final Sectional Business Meetings

Section A. General Entomology, Room 209

Section B. Physiology and Toxicology, Continental Ballroom

Section C. Biology, Georgian Room

11:30-12:00 a.m.

Final Sectional Business Meetings

Section D. Medical and Veterinary Entomology, Room 200

Section E. Control, Extension and Regulatory Entomology, Louis XIV Room

Section F. Chemical Control Investigations, Venetian Room

Wednesday Afternoon, December 4

1:30-3:15 p.m.

Invitational Program, Continental Ballroom, President H. M. Armitage, Presiding

Progress in Pest Control. M. R. Clarkson, Deputy Administrator, Agricultural Research Service, Washington, D. C.

The Effect of Light on Plants. H. A. Borthwick, U.S.D.A., Crops Research Division, Beltsville, Maryland

3:15-4:45 p.m.

Final Business Meeting, Entomological Society of America, Continental Ballroom, President H. M. Armitage, Presiding

4:45-6:00 p.m.

Final Business Meeting, Cotton States Branch, Continental Ballroom, Chairman Norman Allen, Presiding

Wednesday Evening, December 4

7:30-9:30 p.m.

Section C. Subsection b, Apiculture, Room 200

Chairman: W. E. Dunham

Acting Secretary: E. C. Martin

Submitted Papers:

- 7:30 1. Pollination of Several Clovers. Nevin Weaver, Texas Agricultural Experiment Station, College Station
- 7:42 2. Pollination Studies on Low-Bush Blueberries. William R. Lee, University of New Hampshire, Durham
- 7:54 3. The Status of Beekeeping in the United States During the Post-War Decade. W. A. Stephen, North Carolina State College, Raleigh
- 8:06 4. Development of Disease Resistant and Susceptible Lines of Honey Bees from One Mated Queen. Victor C. Thompson and Walter C. Rothenbuhler, Iowa State College, Ames
- 8:18 5. Behavior of Resistant and Susceptible Adult Bees Toward Diseased Brood. Walter C. Rothenbuhler and Victor C. Thompson, Iowa State College, Ames
- 8:30 Recess
- 8:42 6. Differential Resistance to American Foulbrood in Honey Bee Larvae Confirmed by Mixed-Sperm Matings. L. F. Lewis and Walter C. Rothenbuhler, Iowa State College, Ames
- 8:54 7. Microbiological Studies of Honey in Different Relative Humidities. E. C. Martin, Michigan State University, East Lansing

WEDNESDAY EVENING—THURSDAY FORENOON

- 9:06 8. A Mechanical Aid for Bee Keepers During the Extracting of Honey. W. E. Dunham, The Ohio State University, Columbus
- 9:18 9. Some Effects of Terramycin Treatment on Nosema-Infected Bees. T. A. Gochbauer, University of Minnesota, St. Paul
- 9:30 10. Mating Behaviour of Queen and Drone Honey Bee. R. Boch, Department of Agriculture, Ottawa, Canada

7:30-10:00 p.m.

Section F. Chemical Control Investigations, Georgian Room

Chairman: J. E. Fahey
Secretary: B. C. Dickinson

Submitted Papers:

- 7:30 35. The Fate of Some Systemic Insecticides in Soils With Special Reference to Thimet. L. W. Getzin and R. K. Chapman, University of Wisconsin, Madison
- 7:46 36. The Movement of Some Insecticides in Soils. E. P. Lichtenstein, University of Wisconsin, Madison
- 7:54 37. Disappearance of Aldrin and Heptachlor Residues on Alfalfa. E. P. Lichtenstein and J. T. Medler, University of Wisconsin, Madison
- 8:06 38. The Conversion of Heptachlor to Its Epoxide on Plants. Norman Gannon and G. C. Decker, Illinois State Natural History Survey, Urbana
- 8:18 39. The Conversion of Aldrin to Dieldrin on Plants. Norman Gannon and G. C. Decker, Illinois State Natural History Survey, Urbana
- 8:30 40. The Integration of Chemical and Biological Control of the Spotted Alfalfa Aphid in California. Vernon M. Stern and Robert van den Bosch, University of California, Riverside
- 8:42 Recess
- 8:54 41. The Effect of Different Levels of Plant Nutrition on Susceptibility of the Two-Spotted Spider Mite (*Tetranychus telarius* L.) to Malathion. Thomas J. Henneberry, Neil W. Stuart, and Floyd F. Smith, Entomology Research Division, Beltsville, Maryland
- 9:06 42. Insect Problems in Association with Corn Storage in Mexican Tropics. Douglas Barnes, Rockefeller Foundation, Mexico City
- 9:18 43. Effect of Atmospheric Fumigation With Methyl Bromide on the Germination of Grain Seeds. R. G. Strong and D. L. Lindgren, University of California, Riverside
- 9:30 44. Effects of Methyl Bromide Fumigation on the Viability of Barley, Corn, Milo, Oats, and Wheat Seeds. W. Keith Whitney, Marketing Research Division, Manhattan, Kansas
- 9:42 45. Insecticidal Residues in Milling Fractions From Wheat Treated with Methoxychlor, Malathion, and Lindane. John H. Schesser and W. E. Priddle, Marketing Research Division, Manhattan, Kansas

7:30-10:00 p.m.

Motion Pictures Venetian Room

Thursday Morning, December 5

9:00-12:00 a.m.

Section A. Subsection a, Teaching, Venetian Room

Chairman: J. H. Roberts
Secretary: P. C. Stone

Symposium:

- Creating Interest in Entomology
- How Can We Interest More Young People in Entomology? P. C. Stone, University of Missouri, Columbia
 - Entomology in the 4-H Clubs in Louisiana. Kirby Cockerham, Louisiana State University, Baton Rouge
 - The General (or Introductory) Course in Entomology. F. E. Guyton, Alabama Polytechnic Institute, Auburn
 - Student Performance in the Introductory Course. Lee Townsend, University of Kentucky, Lexington
 - Living Insects for the Classroom. C. K. Dorsey, West Virginia University, Morgantown
 - Effective Use of Photography in the Classroom. J. H. Roberts, Louisiana State University, Baton Rouge

9:00-12:00 a.m.

Section B. Physiology and Toxicology, Louis XIV Room

Chairman: Daniel Ludwig
Secretary: J. M. Grayson

Submitted Papers:

- 9:00 23. A Phase Contrast Study of Unfixed Hemocytes of *Prodenia* larvae. Jack Colvard Jones, U. S. Public Health Service, Bethesda, Maryland
- 9:12 24. The Effect of Beta Radiation on the Feeding Activity of *Tribolium* Spp. W. Irvin Rogers and John D. Hilchey, Quartermaster Research and Engineering Center, Natick, Massachusetts
- 9:24 25. Effects of Thiram and Captan on the Confused Flour Beetle. Omar E. Smith and J. H. Lilly, Iowa State College, Ames
- 9:36 26. Effect of Molecular Configuration on Relative Toxicity to House Flies as Demonstrated with the Four Cis Isomers of Allethrin. W. A. Gersdorff, and P. G. Piquett, Entomology Research Division, Beltsville, Maryland
- 9:48 27. Acid and Alkaline Phosphatase in House Flies of Different Ages. Roy J. Barker and B. H. Alexander, Entomology Research Division, Beltsville, Maryland
- 10:00 28. The Activity and Intra-Cellular Distribution of Choline Acetylase in Insect Nervous Tissue. B. N. Smallman, Entomology Division, Science Service, Ottawa, Ontario, and R. Pal, Malaria Institute, New Delhi, India
- 10:12 Recess

THURSDAY FORENOON

- 10:24 29. Physiological Effects of DDT in Larvae of *Galleria mellonella* (L.). Raimon L. Beard, The Connecticut Agricultural Experiment Station, New Haven
- 10:36 30. A Preliminary Study of the Metabolism of Nicotine in Insects. F. E. Guthrie, R. L. Ringler, and T. G. Bowery, North Carolina State College, Raleigh
- 10:48 31. Mode of Action of the Carbamate Insecticides. Herbert H. Moorefield, Boyce Thompson Institute for Plant Research, Yonkers, New York
- 11:00 32. Metabolism of Prolan by Resistant and Susceptible House Flies. Albert S. Perry and Annette J. Buckner, U. S. Public Health Service, Savannah, Georgia
- 11:12 33. The Metabolism of DDT in the Boll Weevil (*Anthonomus grandis* Boh.). Murray S. Blum, Norman W. Earle, and John S. Roussel, Louisiana Agricultural Experiment Station, Baton Rouge
- 11:24 34. Fate of P³²-Labeled Bayer 21/199 in the White Rat. D. A. Lindquist, E. C. Burns, C. P. Pant, and P. A. Dahm, Iowa State College, Ames
- 11:36 35. Studies on the Biochemical Mechanisms of Toxicity of Insecticides. C. P. Pant and Paul A. Dahm, Iowa State College, Ames
- 11:48 36. Regulation of Feeding Activity by Chemotactic Influence of Host Plant Constituents in Grasshoppers and Other Insects. A. J. Thorsteinson, C. Jay, M. Tauber, and P. J. Procter, University of Manitoba, Winnipeg, Canada

9:00-11:30 a.m.

Section C. Subsection d, Ecology and Bionomics, Room 200

Chairman: R. L. Rabb
Secretary: G. T. York

Submitted Papers:

- 9:00 12. Vertical Distribution of Collembola and Mites in Soil. J. W. A. Odetoynbo and J. H. Lilly, Iowa State College, Ames
- 9:12 13. The Comparative NPK Nutrition of *Tetranychus telarius* and *Panonychus ulmi* on Apple Trees. J. G. Rodriguez, University of Kentucky, Lexington
- 9:24 14. Studies on the Biology of the Mite *Caloglyphus mycophagus* Megn, 1874 (Acarina: Acaridae) Including the Effects of Gamma Radiation Upon Certain Developmental Stages. Charles J. Rohde, Jr., Northern Illinois University, DeKalb
- 9:36 15. Plum Curculio Populations in an Unsprayed Peach Orchard in Southern Illinois. S. C. Chandler, Illinois State Natural History Survey, Urbana
- 9:48 16. Effect of European Corn Borer on the Vegetative Growth of Field Corn. H. C. Chiang, University of Minnesota, Duluth Branch, Duluth
- 10:00 17. Factors Influencing the Flight Duration of *Aphis fabae*. H. C. Chiang, University of Minnesota, Duluth Branch, Duluth

- 10:12 Recess
- 10:24 18. Effect of Mutilation of Wings on the Reproduction in *Aphis fabae*. H. C. Chiang, University of Minnesota, Duluth Branch, Duluth
- 10:36 19. Differential Amounts of Material Taken Up By Four Biotypes of Corn Leaf Aphids from Resistant and Susceptible Sorghum Plants. M. D. Pathak and Reginald H. Painter, Kansas State College, Manhattan
- 10:48 20. The Feeding Effects of the Four Biotypes of Corn Leaf Aphids on Susceptible Sorghum and Barley Plants. M. D. Pathak and Reginald H. Painter, Kansas State College, Manhattan
- 11:00 21. Four Years With the Spotted Alfalfa Aphid. R. C. Dickson, University of California, Riverside
- 11:12 22. The Spotted Alfalfa Aphid, *Therioaphis (Pterocallidium) maculata* (Buckton) in Mexico. William R. Young and Rafael A. Padilla, The Rockefeller Foundation Agricultural Program, Mexico City

9:00-11:00 a.m.

Section D. Medical and Veterinary Entomology, Skyway

Chairman: L. E. Rozeboom
Secretary: D. W. Micks

Submitted Papers:

- 9:00 33. Development of Resistance to Insecticides in *Aedes aegypti* (L.) Through Larval Selection. George B. Craig, Jr., Army Chemical Center, Maryland
- 9:12 34. Mosquito Control in Kentucky With Special Reference to *Aedes sollicitans*. Robert E. Woodruff, Kentucky State Department of Health, Louisville
- 9:24 35. Evaporation of Repellents from Skin and Cloth. H. K. Gouck, Claude H. Schmidt, and I. H. Gilbert, Entomology Research Division, Orlando, Florida
- 9:36 36. Prevalence of Adult *Mañsonia perturbans* in Pastured Lowland. W. E. Snow and Eugene Pickard, Tennessee Valley Authority, Wilson Dam, Alabama
- 9:48 37. Uptake of P³²-Labeled Insecticide By *Anopheles quadrimaculatus* Larvae. Claude H. Schmidt and D. E. Weidhaas, Entomology Research Division, Orlando, Florida
- 10:00 Recess
- 10:12 38. Electron Microscope Studies on *Plasmodium cathemerium*. James Eades, Robert Julian, James Street, Don W. Micks and Donald Duncan, The University of Texas, Medical Branch, Galveston
- 10:24 39. Additional Observations on Protozoa of the Family Vorticellidae Infesting Mosquito Larvae. Carl Venard, Ohio State University, Columbus
- 10:36 40. Organic Stimulants to Egg-Hatching in *Haemagogus equinus* Dyar. Paul A. Woke, U. S. Public Health Service, National Institutes of Health, Bethesda, Maryland

THURSDAY FORENOON AND AFTERNOON

9:00-11:30 a.m.

Section E. Control, Extension and Regulatory Entomology, Georgian Room

Chairman: G. D. Jones
Secretary: R. W. Sherman

Symposium:

Enlisting Public Cooperation in Insect Control Programs

- a. Stimulating Public Participation in Preventing Introduction of Alien Insect Enemies. E. P. Reagan, U.S.D.A., Plant Quarantine Division, Washington, D. C.
- b. Public Relations in Federal-State Control Programs. D. G. Hall, U.S.D.A. Information Division, Washington, D. C.
- c. Educating the Public Concerning Mediterranean Fruit Fly Eradication Procedures. E. L. Ayers, Florida State Plant Board, Gainesville
- d. Building Up Public Interest in a County Fire Ant Control Campaign. Gordon Barnes, University of Arkansas, Fayetteville
- e. The Function of the Fish and Wildlife Service in Insect Control Programs. J. B. DeWitt, U. S. Department of the Interior, Fish and Wildlife Service, Laurel, Maryland

9:00-12:00 a.m.

Section F. Chemical Control Investigations, Continental Ballroom

Chairman: J. E. Fahey
Secretary: B. C. Dickinson

Submitted Papers:

- 9:00 46. Chemical Control Studies of Pests of Stored Beans and Corn in Colombia. Robert F. Ruppel, The Rockefeller Foundation, Bogota, Colombia
- 9:12 47. Protecting Corn and Lima Bean Seed from Wireworm Attack with Insecticidal Seed Treatments. J. W. Apple and F. E. Strong, University of Wisconsin, Madison, and E. M. Raffensberger, Virginia Polytechnic Institute, Blacksburg
- 9:24 48. Cultural and Chemical Control of the Lesser Cornstalk Borer in Southern California. H. T. Reynolds and L. D. Anderson, University of California, Citrus Experiment Station, Riverside
- 9:36 49. Spray and Dust Experiments on the Control of the Lesser Corn Stalk Borer on Sorghum. Gordon L. Bender and Grant L. Richardson, Arizona State College, Tempe
- 9:48 50. Evaluation of Granulated Insecticides for Lesser Cornstalk Borer Control. Paul D. Gerhardt, University of Arizona, Mesa
- 10:00 51. A Study of the Ecological Factors Influencing the Time of Application of Chemical Treatments for Corn Earworm. Floyd P. Harrison, University of Maryland, College Park
- 10:12 Recess

- 10:24 52. Insecticide Tests Against the Southwestern Corn Borer *Zeadiatraea grandiosella* Dyar During 1957 in Arkansas. Howard Clem Wall and Willard H. Whitcomb, University of Arkansas, Fayetteville

- 10:36 53. Bulk Density of Granulated Carriers in Relation to European Corn Borer Control. J. A. Harding, Iowa State College, Ames, and M. L. Fairchild, Entomology Research Division, Ankeny, Iowa

- 10:48 54. Pre-Planting Treatment for Billbug Control on Corn. Vernon M. Kirk, South Carolina Agricultural Experiment Station, Florence

- 11:00 55. Sugarcane Borer Control with Ryania, Toxaphene and Endrin. W. H. Long, E. J. Concienne, and L. D. Newsom, Louisiana Agricultural Experiment Station, Baton Rouge

- 11:12 56. The Grape Colaspis as a Pest of Rice in Arkansas. Ernest Philip Rouse and Willard H. Whitcomb, University of Arkansas, Fayetteville

- 11:24 57. Seed Treatment for Control of the Rice Water Weevil. C. C. Bowling, Texas Agricultural Experiment Station, Beaumont

- 11:36 58. Cotton Insect Control and Cotton Yields. John S. Roussel, Louisiana State University, Baton Rouge

Thursday Afternoon, December 5

1:30-3:00 p.m.

Section C. Subsection d, Ecology and Bionomics, Venetian Room

Chairman R. L. Rabb
Secretary: G. T. York

Submitted Papers:

- 1:30 23. Development of an Alfalfa Resistant to the Meadow Spittlebug. M. Curtis Wilson and Ralph L. Davis, Purdue University, Lafayette, Indiana
- 1:42 24. Winter Studies on the Armyworm, *Pseudaletia unipuncta*, in Tennessee. S. G. Breeland, University of Tennessee, Knoxville
- 1:54 25. A Possible Correlation Between the Fat Content and the Reproductive Patterns of *Pseudaletia unipuncta* and Migration. Phillip S. Callahan, Louisiana State University, Baton Rouge
- 2:06 26. Preliminary Studies on the Biology and Control of the Red-Necked Peanutworm, *Stegasta bosqueella* (Chambers), on Peanuts in Oklahoma. R. R. Walton and James R. Gifford, Oklahoma State University, Stillwater
- 2:18 27. The Biology of Philanthine Wasps. Cheng Shan Lin, Huston-Tillotson College, Austin, Texas
- 2:30 Recess

THURSDAY AFTERNOON

- 2:42 28. Observations on the Biology of *Psorophora cyaneescens*. W. E. Snow, Eugene Pickard, and J. L. Hawkins, Tennessee Valley Authority, Wilson Dam, Alabama
- 2:54 29. Notes on the Biology of the Vetch Bruchid, *Bruchus brachialis* Fahr. N. M. Randolph and B. B. Gillespie, Texas Agricultural Experiment Station, College Station
- 3:06 30. Resistance of Wheat Species to the Wheat Stem Sawfly. P. Luginbill, Jr., Entomology Research Division, Bozeman, Montana
- 1:30-3:30 p.m.
- Section F. Chemical Control Investigations, Continental Ballroom
- Chairman: J. E. Fahey
Secretary: B. C. Dickinson
- Submitted Papers:
- 1:30 59. Susceptibility of Cotton Varieties to Thimet Seed Treatment and Insects at Stoneville, Mississippi. M. E. Merkl, T. R. Pfrimmer, R. E. Furr, and E. P. Lloyd, Entomology Research Division, Leland, Mississippi
- 1:42 60. Seasonal Variation in Susceptibility of Boll Weevils to Insecticides. E. P. Lloyd, R. E. Furr, and M. E. Merkl, Entomology Research Division, Leland, Mississippi
- 1:54 61. Field Tests with New Insecticides Against Cotton Insects at Stoneville, Mississippi. T. R. Pfrimmer, E. P. Lloyd, and M. E. Merkl, Entomology Research Division, Leland, Mississippi
- 2:06 62. Dosage-Interval Tests with Phosphate Insecticides Against Cotton Insects at Stoneville, Mississippi. T. R. Pfrimmer and M. E. Merkl, Entomology Research Division, Leland, Mississippi
- 2:18 63. Preliminary Field Cage Studies on the Residual Toxicity of Methyl Parathion, Guthion and Malathion to Adult Boll Weevils. R. E. Furr and E. P. Lloyd, Entomology Research Division, Leland, Mississippi
- 2:30 64. Evaluation of Thimet as a Seed Treatment for Cotton. John K. Reed and C. H. Arndt, South Carolina Agricultural Experiment Station, Clemson
- 2:42 65. Control of the Three Cornered Alfalfa Hopper, *Spissistilus festinus* (Say), in Alfalfa in Louisiana. Dan F. Clower, Louisiana State University, Baton Rouge

NOTES

ABSTRACTS OF SUBMITTED PAPERS

Section A

Section A: GENERAL ENTOMOLOGY

1. FLOYD, E. H. and L. D. NEWSOM, Evidence of the Occurrence of Sibling Species of Rice Weevils in the Southern United States.

Host preference studies, morphological differences in the internal genitalia, general measurements, mating studies and distribution suggest the existence of sibling species of the rice weevil, *Sitophilus oryza* in Louisiana and several of the southern states.

2. BOUDREAUX, H. BRUCE, Interbreeding Potentials Among Different Populations of *Tetranychus telarius* (L.) and of *T. cinnabarinus* (Bois.).

All stocks of North American strains of *T. telarius* interbreed freely. A German stock of this species produces poorly fertile or sterile hybrids when crossed with American stocks. Hybrid lines of German x American stocks have been reared to the 13th generation. Hybrid lines either die out quickly because of sterility (most common) or regain fertility after a few generations. The newly fertile lines are fertile with one but not the other parent stock. Chromosome studies suggest that the fertile "hybrid lines" are extracted forms of either parent stock, and not of hybrid nature. These phenomena also occur in stocks of *T. cinnabarinus* from Germany and America. No reliable morphological differences have been detected to separate the forms, but the breeding evidence suggests that the American forms of both species might be specifically distinct from the European forms.

3. WARD, RONALD A., Host-Parasite Relations of the Mallophaga (Biting Lice) of Pocket Gophers.

A single genus, *Geomydoecus* (Trichodectidae), is restricted to pocket gophers. With the exception of the Valley Pocket Gopher, each American host species is parasitized by a single species of *Geomydoecus*. Closely related host species tend to have related parasites. In some instances the distribution of these Mallophaga is partially on a geographical basis rather than on a strict host basis.

4. DOWNEY, JOHN C., Ecology and Selection in a Polytypic Species of Butterfly.

Plebejus (Icaricia) icarioides, a lycaenid butterfly found in western North America, is polytypic, polymorphic and polytopic. A study of the population dynamics of this species shows that several ecological factors are in full accord with theoretical considerations and with the great bulk of observational data concerning the manner of selection normally believed to take place for polytypic groupings. These factors may be summarized as follows: (1) the abundance of individuals within isolated colonies, (2) the colonial nature of the subgroups which tends to reduce the rate of interbreeding, (3) the climatic variability within the species range which may result in different selective intensities between populations, and (4) the genetic plasticity of the species as evidenced by their ability to thrive in areas of climatic extremes.

5. ROSS, H. H., H. B. CUNNINGHAM, and G. C. DECKER, The Tropical Influence in the *Empoasca* Leafhopper Fauna of Eastern North America.

The *Empoasca* fauna of eastern North America contains two moderately distinctive elements. One of these is the temperate element and the species

comprising it have a fairly widespread distribution over the entire area. The tropical element consists of a group of species whose main range is in the Caribbean area and Central and South America, but which extend into eastern North America varying distances from the southern periphery. Tentative range maps are given for certain members of this tropical element.

6. ROSS, H. H., and H. B. CUNNINGHAM, Characters for the Identification of the Female Sex of the Leafhopper Genus *Empoasca*.

A set of internal structures has been found in the females of *Empoasca* which provide identification aids for separating many species of the genus. These structures are situated at the base of the ovipositor, and are analogous and possibly homologous with the internal structures that Slater and others have described in the Miridae. Illustrations are given for these structures for *Empoasca fabae* and a group of species which is found with it during spring migration.

7. STEYSKAL, GEORGE C., Notes on Richardiinae (Diptera Acalypttratae: Otitidae) with a Review of the Species Known to Occur in the United States.

A synopsis of the species known from the United States (with one new species of *Odontomera*); two new Central American species of *Epiplatea*; and notes and descriptions of the male terminalia of several forms are presented.

8. MEENES, JAMES H., The Alimentary Canal of the Larval Third-Instar European Chafer, *Amphimallon majalis*, Razoumowsky, (Scarabaeidae) and Its Anatomy and Histology.

The anatomy and histology of the alimentary canal of the larval European chafer is similar to that of other Scarabaeid larvae, but some differences do occur. The crop is very much reduced and therefore does not retain completely its characteristic of food storage. Only two groups of caecal diverticula are found on the ventriculus, a group of ten at the proximal portion of the ventriculus and a group of four, ventrally on the distal portion of the ventriculus. There are four Malpighian tubules which originate on the proximal region of the anterior intestine and run freely in the body cavity to eventually terminate in the epidermal tissue of the rectum.

9. CALLAHAN, PHILIP S., Mating and Spermatophore Formation in *Pseudaletia unipuncta*.

The morphology of the reproductive system and formation of the spermatophore are described.

Section B

Section B: PHYSIOLOGY AND TOXICOLOGY

1. FISK, FRANK W., and GEORGE W. WARE, House Fly Bioassay of Gamma BHC in Milk.

As part of a residue analysis program, a controlled feeding experiment with two groups of milk cows, Holstein and Jersey-Guernsey, was set up. Technical BHC (40% Gamma) was added to their diet at levels of 1, 5, 25, and 125 ppm for a period of 50 days. During this period, and for 53 days thereafter, milk from these cows was assayed chemically and biologically for BHC content. Results indicate a maximum concentration of less than 5 ppm total BHC in milk from cows fed 125 ppm.

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Differences between the standard curves prepared with Holstein versus Guernsey milks led to further tests with two series of milk samples, one varying in butterfat, the other in non-fat solids. Butterfat content of homogenized, BHC-treated milk was found to markedly affect its toxicity to flies, while non-fat solids did so only slightly.

2. WARE, GEORGE W., and FRANK W. FISK, Excretion of BHC in Milk from Dairy Cows.

Two series of dairy cows, Holstein and Jersey-Guernsey, were fed daily technical grade BHC (40% Gamma) in acetone added to their feed at the rates of 1, 5, 25, and 125 ppm, for 50 days. Samples were collected at weekly intervals through the feeding period and 15 weeks following termination of the feeding experiment. The milk samples were chemically analyzed for total BHC by a modified Schecter-Hornstein method. Correlations are made with relation to body weight, total intake of BHC, total butterfat and milk yield, and breed of test animal. Milk from cows fed 1 ppm technical grade BHC had detectable amounts of BHC present 2 weeks following end of feeding. Effects of 125 ppm on milk and butterfat yield, appetite and health, and outward appearance are given.

3. MARCH, RALPH B., The Synergistic Action of Combinations of Organophosphorus Compounds.

The synergistic activities of a number of combinations of organophosphorus compounds have been evaluated in the laboratory utilizing the house fly as test organism. Combinations of such insecticides as parathion, malathion, EPN, etc., as well as combinations of these materials with compounds such as triethylphosphate, triethylphosphorodithioate, etc., which are inactive as cholinesterase inhibitors, have been examined. Various characteristics and limits of this action have been determined and a plausible explanation based on our present knowledge of the mode of action of the organophosphorus insecticides has been formulated.

4. REYNOLDS, H. T., R. L. METCALF, and MARIANNE WINTON, Efficiency of Plant Uptake of Di-Syston Following Various Methods of Treatment.

Using P^{32} -Di-Syston, O, O-diethyl S-ethyl-2-mercaptoethylphosphorodithioate the efficiency of plant uptake was measured after soil treatment with various methods of side dressings. The theoretical and practical applications of this work will be discussed.

5. METCALF, ROBERT L., MARIANNE WINTON, and HAROLD T. REYNOLDS, Comparative Rates of Metabolism of Di-Syston at Various Temperatures and in Various Species of Plants.

Using P^{32} -labeled Di-Syston O, O-diethyl S-ethyl-2-mercaptoethylphosphorodithioate and paper chromatography, the comparative rates of oxidative metabolism to the sulfoxide and sulfone derivatives were measured at several temperatures and in a number of plant species. The rates of oxidation were markedly increased at elevated temperatures and differed significantly in the plants studied.

6. PLAPP, F. W. and J. E. CASIDA, Metabolism of Viozene in a Dairy Cow and in Rats.

The metabolic fate of the antimitotic agent, Viozene (O, O-dimethyl O-[2, 4, 5-trichlorophenyl] phosphorothioate), was investigated in rats and a lactating cow. Viozene was stored in the fat and secreted in the milk. The initial detoxification in both animals was by methoxyl hydrolysis.

7. PLAPP, F. W. and J. E. CASIDA, Ion Exchange Chromatography for the Hydrolysis Products of Certain Organophosphorus Insecticides.

An anion exchange resin was adapted to separate the hydrolytic products of phosphate, phosphorothioate and phosphorodithioate insecticides. The hydrolytic products are eluted with hydrochloric acid alone and in mixtures with methanol and acetone. The method was applied to the study of several organophosphorus insecticides.

8. DAUTERMAN, W. C., J. B. KNAACK, T. KOWALCZYK, and J. E. CASIDA, Metabolism and Residues in Cattle Associated with the Antimitotic Agent CL 12,880 (O, O-Dimethyl S-[N-methylcarbamoylmethyl] phosphorodithioate).

The metabolism and residues associated with oral administration of CL 12,880 to dairy cattle were investigated. One cow received 40 mg./kg. and was sacrificed after 6 days; a second received 10 mg./kg. and was sacrificed after 6 days; and a third received 10 mg./kg. and was sacrificed after 12 days. Tissue residues and the nature of the metabolic products were determined.

9. CASIDA, J. E., M. K. AHMED, and R. E. NICHOLS, Significance of Bovine Rumen Organisms in Metabolism of Organophosphorus Insecticides Ingested by Cattle with Particular Reference to Parathion.

Bovine rumen organisms are effective at hydrolyzing and reducing many organophosphorus insecticides. In the case of parathion, the reduction to amino parathion by the rumen organisms appears to be a major factor in reducing the toxicity of this compound to cattle and in the subsequent metabolic breakdown and residues of parathion derivatives that occur in milk and cow tissues.

10. GATTERDAM, P. E., J. B. KNAACK, R. P. NEIDERMEIER, and J. E. CASIDA, Metabolism and Residues of Phosdrin Insecticide Fed to Dairy Cattle.

Studies with 12 lactating cows were conducted to determine the toxicity and residues in the meat and milk resulting from 90 day feeding of 0, 1, 5, and 20 ppm of Phosdrin in the diet. Further metabolism studies were made with radioactive Phosdrin at two mgm./kgm. in a single dose and at one mgm./kgm. daily for seven days.

11. MENGLE, D. C., and J. E. CASIDA, *In Vivo* Studies with Organophosphates on Depression and Recovery of Fly Brain Cholinesterase.

A relationship between mortality and the degree of *in vivo* cholinesterase inhibition has been established. Using manometric techniques the level of cholinesterase activity was established at successive periods following treatment with several organophosphate insecticides. Data is presented indicating correlation of toxicology and symptomatology with the *in vivo* depression and recovery rates.

12. MENGLE, D. C., and J. E. CASIDA, Demonstration of the Competitive Phase of the *In Vivo* Combination of Organophosphate Insecticides and Nerve Acetyl Cholinesterase.

The presence of a reversible or competitive phase of the combination of organophosphate insecticides and acetyl cholinesterase has been established from *in vitro* and *in vivo* studies with fly head homogenates and added amounts of the toxicant. Using rat

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and fly brain preparations from organisms previously treated with organophosphate insecticides, cholinesterase activity was assayed at various substrate concentrations.

13. HORSFALL, WILLIAM R., P. T. LUM, and L. M. HENDERSON, Eggs of Floodwater Mosquitoes (Diptera, Culicidae) V.

Effect of oxygen on hatching of intact eggs.

14. HORSFALL, WILLIAM R., L. M. HENDERSON, and P. T. LUM, Eggs of Floodwater Mosquitoes, (Diptera, Culicidae) VI.

Effect of metabolites on latent embryos in uncapped eggs.

15. ARNOLD, J. W., Hemocytes in the Wing-Veins of the Giant Cockroach, *Blaberus giganteus* (L.).

The passage of hemocytes through the wing-veins was recorded by cinephotomicrography. The film demonstrates the true form of the cells, in circulation and at rest, and their flexibility. It follows their movement through open veins, and through veins partly obstructed by tracheae and by loose clumps of hemocytes.

16. MITLIN, NORMAN, AND ANNE M. BAROODY, The Use of the House Fly (*Musca domestica*, L.) as a Screening Agent for Tumor-Inhibiting Agents.

Earlier work had shown that certain mitotic poisons used as tumor inhibiting agents inhibited the growth of house fly ovaries. It was reasoned therefore that the house fly would make a good biological indicator of the efficacy of anti-tumor drugs. Therefore, 26 compounds which had been used in a collaborative study sponsored by the American Cancer Society on a number of diverse biological systems were tested on the house fly. The results, when correlated with this study, show that the house fly, an easily and cheaply reared animal, can well take its place as a primary screening agent in cancer chemotherapy.

17. SACKTOR, BERTRAM, AND RONALD W. ESTABROOK, The Respiratory Chain in Flight Muscle Mitochondria.

The spectral properties of the respiratory pigments of flight muscle mitochondria (sarcosomes) from the house fly, *Musca domestica*, as recorded at room temperature and when samples are cooled in liquid air, revealed differences in cytochrome content from that observed with mammalian heart muscle or liver mitochondrial preparations. An enzymatically reducible cytochrome c₁, characterized by an absorption band at 554 mμ, was not found either with fly sarcosomes or saline washed particles prepared from these sarcosomes. Such a pigment was apparent, however, upon addition of sodium dithionite or Antimycin A. The appearance of an absorption band at 550 mμ, distinct from cytochrome c, was discovered in preparations of saline washed particles. The relationship of these new respiratory pigments (cytochrome 550 and 554) in electron transport in insect mitochondria will be postulated.

18. ROCKSTEIN, MORRIS, Post-Emergence Maturation in Holometabolous Insects—Cryptic Biochemical Changes Attendant Upon the Apparent Completion of Metamorphosis.

Although post-emergence changes of a morphological nature are a comparative rarity among holometabolous insects, there is accumulating more and more evidence that underlying changes continue to

take place in the imago of such insects, related to maturation of functions like flight, for example. These changes are particularly manifest in a number of enzyme systems which show directed alteration with age in the hours or days immediately following emergence of the apparently completely mature adult. Evidence will be presented from the author's own works as well as those of a variety of other investigators to substantiate this idea of chemical changes underlying functional changes which occur in the young imago and which appear to be necessary to complete the transformation from the immature larval to the adult form, exclusive of sexual maturation itself.

19. HANEC, WILLIAM, AND STANLEY D. BECK, Diapause in the European Corn Borer.

Diapause in the European corn borer (*Pyrausta nubilalis*) is induced in the field by unidentified environmental factors. Induction of diapause in this insect has been attempted in the laboratory by subjecting the larval growth stages to various temperatures and light conditions. Regardless of the photoperiod, incidence of diapause is an inverse function of the ambient temperature. Under high rearing temperatures, the induction of diapause is dependent on the photoperiod. However, the most favorable conditions for induction of diapause appear to be temperature and photoperiod combined. Under certain of these environments, diapause can be induced in a very high percentage of an experimental population.

20. GEORGE, B. W., A Bioassay of Several Inbred Lines of Corn Resistant to the European Corn Borer.

An economical laboratory method of locating and isolating corn resistant to attack by the European corn borer is most desirable. Utilizing the published methods of rearing the corn borer, a diet was formulated for the incorporation of corn to be tested for resistance. Four inbred lines of corn were chosen as representing wide differences in resistance and susceptibility. Samples of the different lines were cut at intervals throughout the growing season. Subsamples were made of parts of the corn plants. Addition of certain parts of resistant corn plants to diets produced a reduction in larval weight, indicating that the resistance of these lines is detectable by this method.

21. ROYS, CHESTER C., The Sense of Taste in *Periplaneta americana* and Its Relation to Basic Characteristics of Nerves.

The data from behavioral and electrophysiological experiments show a close correlation between behavioral responses to the four basic tastes (salt, sour, bitter, sweet) and electrophysiological responses from nerves unspecialized for taste exposed to the same chemicals. This suggests that high sensitivity to salt, acid, bitter and sweet chemicals may be a basic property of many nerves in the cockroach rather than a special property limited to taste receptors.

22. BLOCK, BARTLEY, Loci of the Olfactory End-Organs of *Phormia regina* Meigen.

Blowflies were trained to associate coumarin odor with stimulation of the contact chemoreceptors using Frings' technique (J. Exp. Zool. 88:65, 1941). When the olfactory end-organs were removed, proboscis extension was no longer elicited after conditioning.

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Over 26,000 tests were performed on 750 specimens. Operations consisted of antennectomy, palpectomy, labellectomy, and various combinations of these mutilations. Positive responses of control, sham-operated flies averaged 73%. The positive response upon first presentation of coumarin odor to all flies was 3%. No decrease in positive response percentage was found when flies trained to tarsal stimulation were compared with those fed after each trial. Only the speed of proboscis extension decreased.

Olfactory reception was eliminated only when the antennae, palpi, and labella were removed. Instead of "rewarding" by feeding after a correct response, stimulation of the tarsal taste receptors was in itself sufficient for the acquisition and retention of this learning pattern.

23. JONES, JACK COLVARD, A Phase Contrast Study of Unfixed Hemocytes of *Prodenia* Larvae.

Some observations on the appearance and behavior of certain types of hemocytes in unfixed blood drops from last stage larvae of *Prodenia eridania* are reported.

24. ROGERS, W. IRVIN, AND JOHN D. HILCHEY, The Effect of Beta Radiation on the Feeding Activity of *Tribolium* Spp.

Irradiated *Tribolium* adults lived longer in a culture medium of wheat flour than in the absence of a medium or in the presence of Celite or powdered cellulose. When no culture medium was provided, there was no appreciable difference in the median lethal times between irradiated and unirradiated individuals. Living *Tribolium* fed on the carcasses of beetles which had died previously. The use of either flour or non-nutritive materials eliminated this response. The presence of a thin layer of medium provided no protection from radiation. *Tribolium* larvae were tested similarly. These tests indicate that *Tribolium* adults are capable of damaging or infesting subsistence items after the beetles have been exposed to doses of beta radiation which produce delayed lethal effects.

25. SMITH, OMAR E., AND J. H. LILLY, Effects of Thiram and Captan on the Confused Flour Beetle.

Mixtures of fungicide and whole wheat flour were used to maintain paired adults in vials, and also to complete the life cycles of the larvae hatched from the eggs laid by these insects. Both thiram and captan were relatively non-toxic to both adults and larvae under the conditions of these experiments.

26. GERSDORFF, W. A. AND P. G. PIQUETT, Effect of Molecular Configuration on Relative Toxicity to House Flies as Demonstrated with the Four *CIS* Isomers of Allethrin.

The *l*-allethrolone *d-cis* chrysanthemic acid ester, the *d-l* ester, the *d-d* ester, and *l-l* ester were, respectively, 0.33, 0.14, 1.8, and 0.056 as toxic as allethrin.

With the acid component of the molecule of the *l* form, the change from the *l* to the *d* form of the allethrolone component increased the toxicity of the ester by a factor of 2.4. With the allethrolone component of the *l* form, the change from the *l* to the *d* form of the acid component increased the toxicity of the ester by a factor of 5.8. With the common component of the *d* form, a similar change in the other component increased toxicity by factors 2.2 the two above.

27. BARKER, ROY J., AND B. H. ALEXANDER, Acid and Alkaline Phosphates in House Flies of Different Ages.

The activity of acid and alkaline phosphatase was determined in the egg, larva, pupa, and adult of the house fly. Analyses were based on the hydrolysis of β -naphthol phosphate. Acid phosphatase activity was highest in eggs and puparia. The activity in female adults was greater than that in the adult male but this finding does not seem to be associated with the longer life span of the female.

Alkaline phosphatase activity was highest in two-day-old larvae.

28. SMALLMAN, B. N., AND R. PAL, The Activity and Intra-Cellular Distribution of Choline Acetylase in Insect Nervous Tissue.

Choline acetylase, the terminal enzyme in the synthesis of acetylcholine, was studied previously in extracts of acetone powders of whole blowfly heads. In this study, the activity and intracellular distribution of the enzyme was determined using homogenates of roach cords. The presence of ATPase reduced the rate of formation of the substrate, acetyl CoA, and prevented the synthesis of acetylcholine at optimal rates. Optimal rates were obtained, and homogenates were as active as acetone powders, when pre-formed acetyl CoA was supplied. Estimates of the activity of choline acetylase of roach cords, house fly heads and mouse brain confirmed previous indications that the activity of the enzyme in insects is much higher than in mammals. A further difference was revealed by the finding that the enzyme was associated with the supernatant after high speed centrifugation, whereas, in mammalian brain it appears to be associated with mitochondria.

29. BEARD, RAIMON L., Physiological effects of DDT in Larvae of *Galleria mellonella* (L.).

In this insect muscle exhaustion is adequate to account for the fatal consequences of DDT intoxication. The nature of this exhaustion depends upon the form and manner of administration and post-treatment environment. It can result from a gross depletion of reserves or under very special circumstances from a breakdown in the energy cycle. In the latter instance dramatic recoveries can be effected by the administration of such things as ATP, adenosine or glucose. Visceral spasms occur independently of body convulsions in DDT poisoning, but they apparently do not contribute to the lethal effects.

30. GUTHRIE, F. E., R. L. RINGLER, AND T. G. BOWERY, A Preliminary Study of the Metabolism of Nicotine in Insects.

Utilizing an ascending paper chromatographic technique, a number of metabolites were isolated from insects previously treated with nicotine. Certain of the metabolites were identified by comparison of *R_f* values and ultraviolet absorption spectra. Cotinine, injected dosages of which were found to be non-toxic, was identified as the main metabolite in the American cockroach. The metabolite in the German cockroach was found to be very similar to cotinine but was not positively identified. Thirteen unidentified metabolites were found in the southern armyworm. Excretion of detectable quantities of the metabolites did not generally occur until about 10 hours following treatment with nicotine.

Section B

31. MOOREFIELD, HERBERT H., Mode of Action of the Carbamate Insecticides.

Experimental evidence supporting the view that the carbamate insecticides inhibit cholinesterase as an intact molecule will be described. Stability of the carbamate-inhibited-cholinesterase complex; site of carbamate attachment on the enzyme surface; and correlations between insect toxicity, cholinesterase inhibition and stability to hydrolysis will be discussed. The relative affinity of various carbamate inhibitors for esterases from different sources can be demonstrated; this poses an inference that such specificity may play a role in differential toxicity (mammal or insect).

32. PERRY, ALBERT S., AND ANNETTE J. BUCKNER, Metabolism of Prolan by Resistant and Susceptible House Flies.

A susceptible laboratory strain of house flies exhibited resistance to Dilan after several generations of selection pressure with this insecticide. Resistance to Prolan was much greater than Bulan, both of which are constituents of Dilan.

Metabolism tests showed that 80-90 per cent of the Prolan absorbed had disappeared within 48 hours after topical application of the chemical to female resistant flies. Two compounds were detected in the excreta of treated flies: (1) a neutral material, soluble in common organic solvents, similar to Prolan in infrared and colorimetric spectra and almost as toxic to mosquito larvae as the parent compound, (2) an acidic material, extractable with dilute alkali, only slightly toxic to mosquito larvae and different from Prolan in photometric spectra and chemical properties. No such products were recovered from the excreta of Prolan-treated susceptible house flies.

33. BLUM, MURRAY S., NORMAN W. EARLE, AND JOHN S. ROUSSELL, The Metabolism of DDT in the Boll Weevil (*Anthonomus grandis* Boh.).

The rates of penetration of DDT in weevils of different ages and strains are reported. Penetration is slowest in overwintering weevils and fastest in weevils 1-2 days old. No differences are observed in the penetration rates in chlorinated-hydrocarbon resistant and susceptible weevils. A large percentage of the penetrated DDT is converted to a metabolite which does not respond to the Schechter-Haller test. DDE is produced in trace amounts but neither DDE or DDA are metabolized appreciably by the weevil. DDT synergists, when applied either topically or by injection with DDT, show negligible synergistic activity. However, DDT is substantially more toxic to the weevil when injected as compared to topical application. The topical LD₅₀ of DDT varies with the age of the weevil and with the strain examined. The ineffectiveness of DDT as a weevil insecticide is discussed in relation to these results.

34. LINDQUIST, D. A., E. C. BURNS, C. P. PANT, AND P. A. DAHM, Fate of P³²-Labeled Bayer 21/199 in the White Rat.

P³²-labeled Bayer 21/199 was administered orally in corn oil to white rats at a dosage of 20 mg./kg. Nearly 85% of this dose was excreted in the urine within 24 hours. Paper chromatography of the urine showed only one metabolite and no Bayer 21/199. About 12% of the administered dose was excreted in the feces over a 3-4 day period. Small amounts of radioactivity were found in the blood, bile, and lymph. Several tissues of the treated rats were radioassayed 24 hours after treatment to measure the distribution of Bayer 21/199 and its metabolic products.

35. PANT, C. P., AND PAUL A. DAHM, Studies on the Biochemical Mechanisms of Toxicity of Insecticides.

The effect of *in vivo* application of HCN, CS₂, ethylene dichloride, ethylene dibromide, DDT, pyrethrum, and Dipterex on the cytochrome oxidase, succinic dehydrogenase, over-all glycolysis and distribution of P³²-labeled intermediates of the thoracic muscle tissue of the house fly, *Musca domestica*, has been studied.

Cytochrome oxidase activity, measured spectrophotometrically was inhibited by HCN, CS₂, and Dipterex. Ethylene dichloride and ethylene dibromide produced a marked increase in the activity. Succinic dehydrogenase activity was measured manometrically and was inhibited by ethylene dichloride, DDT, Dipterex, and pyrethrum. A stimulatory effect was produced by CS₂. Over-all glycolysis was measured manometrically and both CO₂ and lactic acid production were measured. Marked inhibition was observed in the case of CS₂, ethylene dibromide, Dipterex, and pyrethrum. Stimulatory effects were observed with ethylene dichloride, HCN, and DDT. The effects of these insecticides on the distribution of phosphorylated intermediates were studied by a combined radioactive tracer paper chromatography technique.

36. THORSTEINSON, A. J., C. JAY, M. TAUBER, AND P. J. PROCTER, Regulation of Feeding Activity by Chemotactic Influence of Host Plant Constituents in Grasshoppers and Other Insects.

Substances were isolated from plant extracts by means of paper chromatography. Feeding responses of insects to the isolates in pith discs were measured. Insects studied included *Camnula pellucida*, *Leptotarsa decemlineata*, and *Sitona cylindricollis*. Active substances included amino acids, carbohydrates and unidentified pigments.

Section C—Subsection a

Section C: BIOLOGY

Subsection a, Biological Control

1. WHITCOMB, WILLARD H., AND LEON MOORE, Spiders and Predation in Arkansas Cotton Fields.

Preliminary studies were made as to the activities of spiders in cultivated crops with emphasis on cotton. Spiders were found to serve as food for predaceous insects, to consume sizeable numbers of destructive insects, to feed on various insect predators, and to devour each other. Practically all cotton pests were preyed on at one time or another by spiders. A large number of families of Arachnida were represented in cotton field collections. Species differed widely in their biology and feeding habits.

2. RABB, R. L., AND F. R. LAWSON, Some Factors Influencing the Predation of *Polistes* Wasps on the Tobacco Hornworm, *Protoparce sexta* (Johan.)

In an acre of untreated tobacco, predators, chiefly *Polistes*, killed 68 per cent of a very high population of hornworms. Within a distance of 800 feet, the percentage of wasps hunting in tobacco was inversely proportional to the distance of the wasp colonies from tobacco.

Most hornworms brought by *Polistes* to their nests were third and fourth instars; however, many smaller larvae were killed and consumed or discarded in the field. Large fifth instars were less commonly killed.

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Hornworms and green cloverworms were the most numerous species in samples of *Polistes* prey. The percentage of green cloverworms in prey samples dropped sharply immediately after the destruction of three large fields of soybeans.

Polistes failed to give economic control of hornworms in the experimental field probably due to the scarcity of nesting sites near tobacco, the abundance of alternate prey, and the exceedingly high population of hornworms.

3. KRAMER, JOHN PAUL, The Effects of Extremes in Temperature on Populations of *Pyrausta nubilalis* (Hbn.) Infected with *Perezia pyraustae* Paillot.

Field collections of living fifth instar *Pyrausta nubilalis* larvae were made in seven counties in central Illinois in a fall-spring-fall sequence. These larvae were assayed for the presence of *Perezia pyraustae* infections. In the seasonal incidence of this protozoan parasite, marked differences were noted which suggest that the parasite decreases the ability of the larva to withstand the stress of cold weather.

Collections of living and dead *Pyrausta nubilalis* pupae were made in early summer in five central Illinois counties following a period of high temperatures. Assays for the presence of *Perezia pyraustae* infections were made. A preponderance of the dead insects were infected with the protozoan parasite. In contrast, the incidence of infected pupae among the survivors of this period of high temperatures was small. It is suggested that the upper limits of thermal tolerance are limited by the presence of this parasite.

Experimental evidence obtained in the laboratory concerning the effects of temperature extremes on infected larvae and pupae is discussed.

4. FLANDERS, STANLEY E., Ecological Prerequisites for the Establishment of Effective Entomophagous Insects.

The native habitat of a pest is the most likely source of an effective natural enemy. The sources of an exotic entomophagous insect should include the kind of plant or animal upon which the host insect in the country of destination is a pest. The entomophagous insect which is the dominant natural enemy at a low density of a pest species is most likely to prove effective, provided that other host species at the time of collection were either rare or lacking. A potentially effective natural enemy may not be dominant at any density if it is specific in its host relations and exists in direct competition with effective non-specific natural enemies.

Biological control projects hitherto unsuccessful, which were not operated on these bases, may be reactivated with profit. In such projects the colonized natural enemies may not have represented all the types of environments in which the pests occurred at low densities nor have included any derived from the kind of pest-infested organism, plant or animal, upon which they were colonized.

5. CHARPENTIER, LEON J., Recent Attempts to Establish Sugarcane Borer Parasites in Louisiana.

Studies are being conducted to determine the possibilities of obtaining economic control of the sugarcane borer with larval parasites. Two tachinid species, the Amazon and Cuban flies, are being introduced from Trinidad, B. W. I., and released in Louisiana sugarcane fields. The Cuban fly has been recovered on all release plantations and became established in fields up to 2 miles from the nearest

release points. Limited numbers of this species have survived the winters in summer-plant sugarcane which is not harvested in the year of planting. Four species of miscellaneous stalk borers and pink bollworm parasites from India were ineffective against the borer.

6. VAN DEN BOSCH, ROBERT, Status of Imported Parasites of the Spotted Alfalfa Aphid in California.

A search for parasites of the spotted alfalfa aphid in the Old World during 1955 and 1956 resulted in the obtaining of three promising hymenopterous species, *Praon palitans*, *Trioxys utilis*, and *Aphelinus semiflavus*. All three species became established in California in the summer of 1956. During the ensuing year and a half *Praon palitans* and *Trioxys utilis* multiplied and spread very rapidly and have reached important status in several sizeable areas in southern California. Colonization methods, evaluation techniques, and certain aspects of the parasite biologies are discussed.

7. MACPHEE, A. W., AND K. H. SANFORD, The Selection of Pest Control Chemicals with Minimum Effect to Natural Enemies.

A large measure of pest control is achieved in Nova Scotia apple orchards by the natural controls. A number of pesticides are available for the control of apple scab, insect and mite pests but those least harmful to beneficial arthropods are selected and recommended. The choice is based on field tests against natural control agents. Selectivity is obtained through the use of specific materials, by the timing of treatments, and by the formulation. The methods include field tests on comparatively dense and uniform populations of each beneficial species, on general observations, and on long-term treatment of large plots. The data on the effect of chemicals on natural control agents permit manipulation of arthropod populations.

8. KNIGHT, FRED B., The Effects of Woodpeckers on Populations of the Engelmann Spruce Beetle.

Woodpeckers are a major cause of mortality of the Engelmann spruce beetle (*Dendroctonus engelmanni*). This beetle mortality is attributable to two factors: (1) the direct effect of feeding, and (2) the indirect effect of desiccation after the removal of bark. No attempt has been made to measure either of the contributing factors since both may be considered mortality caused by woodpeckers.

Populations of the Engelmann spruce beetle have been determined in samples from 225 infested trees. These samples consisted of population measurements in portions of the bole protected from woodpecker and other measurements in portions not protected. Each tree was classified into one of five woodpecker feeding categories: light, light to moderate, moderate, moderate to heavy, and heavy. The survival of beetles expressed in per cent was: 56, 41, 36, 16, and 2, respectively. The per cent of survival is not a measure of actual survival because the intensities of infestation also vary. The largest number of beetles survived in the moderate classification.

Section C—Subsection b

Section C: BIOLOGY

Subsection b, Apiculture

1. WEAVER, NEVIN, Pollination of Several Clovers.

By planting *Trifolium* clovers in rows and establishing plots across the rows, the insect pollination requirements of six clovers were tested simulta-

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neously. Honey bees were restricted to five caged plots, excluded from five caged plots, and allowed free flight into and out of five uncaged plots. Honey bees generally restricted their foraging to one species of clover on any one trip. The attractiveness of the clovers to bees was variable, and depended on the amount of nectar available and the shape of the blossoms. The clovers ranged from completely self fertile to virtually self sterile.

2. LEE, WILLIAM R., Pollination Studies on Low-Bush Blueberries.

Three pairs of 3 x 6 x 3 feet cages of 18 x 14 mesh screen wire were placed over clones of low-bush blueberries. Each pair of cages was placed over two adjacent clones so that a part of each clone was in both cages. One cage in each pair contained a nucleus (small bee hive).

Fruit set in the cages containing the nucleus was 72, 92, and 40 percent in contrast to 0, 15, and 2 percent, respectively, in the adjacent cages without a nucleus. In the latter two cages bees accidentally gained entrance. Only 5 percent of the fruit set dropped before harvest.

It was concluded: 1. Insect pollination is essential for fruit set on low-bush blueberries. 2. The low-bush blueberry is capable of setting and maturing fruit on a high percentage of its flowers. 3. The honey bee is capable of pollinating low-bush blueberries.

3. STEPHEN, W. A., The Status of Beekeeping in the United States during the Post-War Decade.

Analysis of the figures for the past 11 years as published by the U. S. D. A. Agricultural Marketing Service Crop Reporting Board shows a decrease in numbers of honey bee colonies in two-thirds of the states. The greatest decline by areas is in the east north central and west north central divisions. It is these areas that have the highest per colony production of honey.

The only major states in which significant increases have occurred are Florida and California. Over 10 per cent of the honey bee colonies in the United States are now located in California, which in 1956 produced over thirteen per cent of the total honey crop.

4. THOMPSON, VICTOR C., and WALTER C. ROTHENBUHLER, Development of Disease Resistant and Susceptible Lines of Honey Bees from One Mated Queen.

The heritable nature of the honey bee's response to American foulbrood has been further established by the simultaneous development of a resistant line and a susceptible line from one mated queen. Initially a group of daughter queens were reared from the original queen and these were mated to her sons. Colonies developed from these daughters were inoculated by inserting comb containing dead, diseased larvae into the broodnest. The queens heading the most resistant colonies were used to start a resistant line and those heading the most susceptible colonies to start a susceptible line. Continued breeding, inoculation, and selection within each subline has separated them decisively from each other by making the one more resistant and the other more susceptible.

5. ROTHENBUHLER, WALTER C., and VICTOR C. THOMPSON, Behavior of Resistant and Susceptible Adult Bees Toward Diseased Brood.

It has been observed previously by Park, and by Woodrow and his co-workers that the removal of American-foulbrood diseased larvae from the broodnest of a honey bee colony probably served as a mechanism of resistance to the disease. The present studies which utilized selected, inbred, resistant and susceptible lines, showed great differences in extent and time of removal of diseased larvae. The resistant line removed all diseased brood prior to the sixteenth day following inoculation on the first day of larval life. Peak removal occurred usually on the eighth to tenth days. The susceptible line allowed most diseased brood to remain in the broodnest throughout the experiments which ended on the sixteenth day.

6. LEWIS, L. F., and WALTER C. ROTHENBUHLER, Differential Resistance to American Foulbrood in Honey Bee Larvae Confirmed by Mixed-Sperm Matings.

Existence of different levels of resistance to American foulbrood in genetically different larvae has been both affirmed and denied on the basis of published data. In the present study, each of a number of queens was mated to one genetically marked, resistant-line drone and one genetically marked, susceptible-line drone. Individuals fathered by each drone were distinguishable. Samples of larvae of limited age variation were secured in single combs. The food of some larvae was inoculated with *Bacillus larvae* spores in water and that of other larvae was inoculated with water only. Progeny of the susceptible-line drones occurred in significantly lower frequencies among certain spore-treated larvae than they did among comparable water-treated larvae. This is interpreted to mean that progeny of the susceptible-line drones possessed less larval resistance to American foulbrood, at a given age, than did progeny of the resistant-line drones.

7. MARTIN, E. C., Microbiological Studies of Honey in Different Relative Humidities.

The aerobic development of large numbers of osmophilic yeasts was found to occur at the surface of honey samples exposed to high humidities. Below the surface of the same samples, the honey-fermenting yeasts developed anaerobically at a relatively much slower rate. Equilibrium points have been established between the water content of liquid honey and relative humidities of 52, 58, 66, 76, and 81 per cent.

8. DUNHAM, W. E., A Mechanical Aid for Bee Keepers During the Extracting of Honey.

9. GOCHNAUER, T. A., Some Effects of Terramycin Treatment on Nosema-Infected Bees.

Brood production by package colonies of honey bees fed $\frac{1}{2}$ -1 gram Terramycin activity per gallon of syrup is reduced in contrast to control colonies. The reduction of brood colony development is accompanied by levels of nosema infection equal to or greater than the levels of nosema infection found in check colonies. In addition, the peak of infection is prolonged past that experienced by controls, which normally show decreased levels with the emergence of the first brood cycle as adults. In studies of the effect of drugs on nosema-inoculated caged bees without brood or comb, Terramycin treatments appeared

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to result in a nosema level greater than that of bees in control cages. This apparent enhancement was not found in bees fed Terramycin plus Fumidil B.

During the course of examination of bees for nosema, it was noted that bees in the Terramycin or Terramycin-Fumidil treatments contained exceptionally large numbers of yeasts in contrast to those receiving Fumidil or syrup alone. The conclusion is that Terramycin markedly alters the "normal" flora of the gut of the bee; perhaps as a result, the nosema organism is better able to flourish. In any event, the total effect is to reduce the developmental rate in an otherwise "normal" honey bee package colony. The relation of this effect to problems in honey bee experimentation and colony management will be discussed.

10. BOCH, R., Mating Behavior of Queen and Drone Honey Bee.

This paper reviews data obtained in studies on the multiple mating and mating range of queen bees at Ottawa and reports on experiments to determine the possible "role" of the sense organs and scent glands in mating. Other data presented include the flight behavior of drones and queens.

Section C—Subsection c

Section C: BIOLOGY

Subsection c, Relations of Insects to Plant Diseases

1. KNOKE, J. K., and R. K. CHAPMAN, Six-Spotted Leafhopper Control in Relation to the Incidence of Purple-Top Wilt of Potatoes.

Purple-top wilt of potatoes, a virus disease transmitted by the six-spotted leafhopper, although often of minor importance in Wisconsin, was very serious in 1957 with virus incidence up to 60% in some fields. Control of this disease by reduction of the insect vector has been obtained with foliage applications of DDT and various soil applications of systemic insecticides such as Thimet.

2. RAWLINS, W. A., and K. H. FERNOW, Incidence of Potato Leaf-Roll as Influenced by Aphid Control.

Marked reductions in the incidence of potato leaf-roll have been obtained by control of aphids, particularly *Myzus persicae*. An exception was noted in 1956 when the experimental plots adjoined a field with a high incidence of seed tuber disease.

3. SMITH, FLOYD F., and PHILLIP BRIERLEY, Some Insect Injuries Resembling Plant Virus Symptoms.

Feeding injuries by several species of aphids, leafhoppers and mites and virus symptoms on the same hosts will be compared.

4. DICKSON, R. C., and E. F. LAIRD, JR., Whitefly-Borne Plant Viruses.

Leaf-crumble of cotton is the only presumed indigenous whitefly-borne plant virus in North America. The South American abutition mosaic has been reported in Florida. Cotton leaf-curl and cassava mosaic are serious African diseases carried by whiteflies. Tobacco leaf-curl and bhendi yellow-vein mosaic occur in southern Asia.

These diseases are all carried by whiteflies of the genus *Bemisia* and have shown enough other similarities that they seem to constitute a group.

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Section C: BIOLOGY

Subsection d, Ecology and Bionomics

1. GAINES, J. C., Losses Caused by Various Levels of Pink Bollworm Infestations.

Results of experiments to determine the effect on the yield and quality of cotton of different levels of pink bollworm infestations are presented. These data indicate the level of infestation that the plant can tolerate and the losses which occurred at higher levels of infestation under certain weather conditions.

2. BRAZZEL, J. R., and L. D. NEWSOM, Diapause of the Boll Weevil.

Boll weevils that survive the winter in Louisiana are in a state of diapause. Diapausing weevils differ morphologically and physiologically from reproducing weevils. Both oogenesis and spermatogenesis ceases. The ovaries atrophy and no eggs are present. Testes become small, compact and yellow in color. Fat content increases to over 30% based on percentage of dry weight. Water content drops from about 60% to 50% based on live weight.

Diapausing weevils were first found in the field on 30 July and collected in ground trash from near the same field on 16 August. More males than females are present in fields in which diapausing weevils are developing. The sex ratio of trash collected weevils and those collected on seedling cotton in the spring was about two males for one female.

3. HUNTER, ROBERT C., Behavior Studies on the Cotton Boll Weevil in Relation to Insecticides.

Continuous observation of boll weevils for forty-eight hours showed that activity is stimulated by the onset of daylight and that activity within the daylight period is affected by temperature and humidity. Weevils spent most of their time on squares, spent much less time on stems and terminals, and practically avoided foliage except during periods of great activity. Observations on habits indicate that the boll weevil secures a lethal dose of stomach poison by nibbling on pubescence of stem and leaf surfaces, feeding on stem and leaf surfaces, and by accidental contact of the proboscis with stem and leaf surfaces when walking.

4. MALLIS, ARNOLD, A. C. MILLER, and R. C. HILL, Feeding by Four Species of Fabric Pests on Natural and Synthetic Textiles.

Larvae of the webbing clothes moth, *Tineola bisselliella* did not feed on silk, nylon, viscose rayon, Orlon, Dynel, and Dacron. Acetate rayon showed slight feeding. Larvae of the black carpet beetle, *Attagenus piceus*, did not feed on acetate rayon, Orlon, or Dynel. Silk and nylon showed slight feeding, and viscose rayon and Dacron showed very slight feeding. The wedding clothes moth, the black carpet beetle, and the furniture carpet beetle, *Anthrenus flavipes*, fed on wool and combinations of wool and nylon, wool and Orlon, and wool and rayon. Firebrats, *Thermobia domestica*, did not feed on nylon, Dynel, Dacron, Orlon, acetate rayon, Vicara and silk. They ate viscose rayon. Linen and cotton showed slight feeding by firebrats.

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5. LINSLEY, E. G., and J. W. MACSWAIN, The Significance of Floral Constancy Among Bees of the Genus *Diadasia* (Anthrophoridae).

At least thirteen of the North American species of *Diadasia* are oligolectic visitors to plants of the family Malvaceae, especially of the genus *Sphaeralcea*. Presumably these species evolved in geographic isolation in the peripheral and isolated mountain ranges of southwestern United States and northern Mexico, where the bees and their pollen plants abound, and have subsequently been brought together through the advent of agriculture and man-made roads which favor both. However, three species are oligoleges of Cactaceae, one each of Onagraceae, Convolvulaceae and of Compositae, suggesting speciation associated with a sudden change of pollen plants. Data derived from a study of one of the castus-visiting species suggest a mechanism by which this might have occurred.

6. STRONG, F. E., Temperature Response by the Seed Corn Maggot.

A lack of specific information concerning the biology of the seed corn maggot in Wisconsin prompted a life history study of *Hylemya ciliarura*, under field, insectary and laboratory conditions. Previous observations resulted in the impression that there were two spring broods and one fall brood, the whereabouts of the insect during the hotter summer months being unknown.

In 1957, laboratory experiments indicated that maggots do not develop appreciably below 50°F. Using 50°F. as a developmental base, it was found through insectary experiments that an average of 572.5 day degrees (based on air temperatures) were required to pass from egg to adult. Using soil temperatures under field conditions, observations showed a mean of 606.6 day degrees between peaks of adult emergence.

The theoretical number of generations per year in Wisconsin is 4.3. No evidence was obtained to indicate that the pupae estivate in the hotter summer months.

7. PIMENTAL, DAVID, Insect Populations on Sparse and Dense Plant Populations.

The animal community associated with *Brassica oleracea* was used as the model in this study. It was found the animal populations were dense on sparse plant populations and sparse on dense plant populations on a per plant and per unit plant-surface area density measurement.

8. BEAN, JAMES L., The Use of Larvaevorid Maggot Drop as a Means of Measuring Spruce Budworm Populations.

This method is based on the assumption that, if parasitism of full-grown spruce budworms by certain larvaevorid species can be accurately determined, the number of maggots falling on a unit area of the ground will be an index of the spruce budworm population in the tree above that area.

Measurements of maggot drop were obtained from cone-shaped muslin traps suspended beneath the crown of individual study trees. Data on budworm populations and larvaevorid parasitism were obtained from trees cut-down and all budworms removed and reared.

The drop was uniform at any point equidistant from the trunk of the tree but was not uniform along a radius of the crown projection. An analysis of the cone trap data showed that the trap adjacent to the tree trunk gave the most reliable estimate of the total drop. The peripheral trap gave the least.

9. NORRIS, DALE M., JR., Population Dynamics of *Conoderus falli* Lane as Related to Tuber Injury in Potato Fields of Northern Florida.

Through soil sampling of several experimental potato plots, the population of *Conoderus falli* in each of these particular areas was found to decline 60 or more per cent in the interval from November to April. This period includes the major potato growing season in north Florida. This considerable reduction in the population is attributable to factors other than insecticides. Under these conditions of population reduction, wireworm injuries to tubers were still severe and many lots of potatoes failed to grade U.S. to No. 1A. Thus, the soil population level of *Conoderus falli* necessary in order to cause significant injury to potato tubers is quite low.

10. ANDERSON, LAUREN D., and HENRY NAKAKIHARA, Effect of Substrate Color on Corn Earworm Moth Oviposition.

In studying chemical attractants for the corn earworm moth, it was discovered that this moth reacts differently in degree of oviposition on cloth patches of different colors. Yellow and white patches received the most eggs, followed by green, orange and red; purple, black, blue and brown received practically no eggs.

11. BROOKING, B. C., B. M. GLANCEY, and H. B. BOUDREAUX, A Study of Factors Involved in Diapause in the Southern Legume Spider Mite, *Petrobia apicalis* (Banks).

Active stages of this mite occur during late fall, winter and early spring on various legumes. Diapause eggs are produced in the spring under the influence of increasing day length and rising temperature. The production of diapause eggs may be induced by feeding on yellowed heavily infested food plants independent of temperature or day length. Diapause eggs cannot be induced to hatch until a certain amount of embryonic development has occurred. Hatching occurs in the fall after combined stimulation by moisture and cold.

12. ODETOYINBO, J. W. A., and J. H. LILLY, Vertical Distribution of Collembola and Mites in Soil.

Studies of Collembola and mites in agricultural soil in central Iowa in 1956-57 showed that these arthropods were fairly numerous to depths of 48 inches.

13. RODRIGUEZ, J. G., The Comparative NPK Nutrition of *Tetranychus telarius* and *Panonychus ulmi* on Apple Trees.

Apple trees were grown in nutrient culture in the greenhouse on a series of N and P nutrient levels. Absorbed N, P, and K were correlated with the development of mites on detached leaf disks cultured in the laboratory *Tetranychus telarius* and *Panonychus ulmi* generally exhibited similar reactions to the levels of nutrient supply. Relationships with absorbed N, P, and K were not as well defined with *P. ulmi* as with *T. telarius*.

14. RHODE, CHARLES J., JR., Studies on the Biology of the Mite *Caloglyphus mycophagus* Megn., 1874 (Acarina: Acaridae) Including the Effects of Gamma Radiation Upon Certain Developmental Stages.

Two hundred fifty eggs were isolated in chambers of ten rearing boxes and observations made at 4-hour intervals until a number of adults were obtained. The incubation period was less than nine hours. The

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larval stadium ranged from one to four days. Fifty per cent in the protonymph stadium completed this period in less than 26 hours. The tritonymph stadium was completed in 30 hours. Over 85% of the 158 adults obtained completed the three inert periods in fewer than 13 hours per period. The average duration of the life cycle was six days.

Eggs of maximum 24 hour age were exposed to increasing instantaneous gamma dosages delivered in air at increments of 250 r up to 3750 r. Viability appears to decrease linearly as the dose increases.

Radiation-induced sterility in virgin adults determined by the viability of eggs when paired with normal adults is obtained at gamma doses of 4000, 5000, 8000, and 12,000 r.

15. CHANDLER, S. C., Plum Curculio Populations in an Unsprayed Peach Orchard in Southern Illinois.

Weekly jarrings for five seasons showed a great reduction of adults of *Conotrachelus nenuphar* from the overwintering to the first generation during two drouth years and one year of total crop loss from freeze. Total numbers jarred for the season dropped from 495 on five trees in 1953 to 36 in 1956, but with a return to more nearly normal moisture conditions and an excess of it in the last year, 338 were jarred in 1957. Harvest infestations followed a similar pattern, with 88% of the fruit injuries in 1953, 8% in 1956, and 50% in 1957.

16. CHIANG, H. C., Effect of European Corn Borer on the Vegetative Growth of Field Corn.

Four different effects of infestation of the European corn borer on the vegetative growth of the corn plant are described. They are retardation of the emergence of tassel from the leaf whorl, retardation of the emergence of silk from the ear husks, reduction of plant height, and reduction of the length and the width of leaves.

17. CHIANG, H. C., Factors Influencing the Flight Duration of *Aphis fabae*.

The winged adults of *Aphis fabae* were induced to fly freely and continuously to near exhaustion. Since the aphids fly in mid-air and are not interfered with by any mechanical support, it is possible to observe their natural flight behavior. First, they carry on a cruising flight for 1.5 to 3 hours, and then turn to a directional flight which lasts about half an hour before exhaustion. It was found that the wind speed, the group effect, and the age and size of the individual all affect the duration of flight. The possible significance of these findings on the dispersal of this insect is also discussed.

18. CHIANG, H. C., Effect of Mutilation of Wings on the Reproduction of *Aphis fabae*.

The parthenogenetic winged adults of *Aphis fabae* usually start to deposit their young about 24 hours after emergence if they have had a certain amount of exercise in the form of flying or walking. However, if they are confined so exercise is not possible, they will not deposit young until at least 12 hours later. Mutilation of the wings of the aphid was found to cause the aphid to deposit young within 24 hours after emergence, even without flight. The possible biological implication of this finding will be discussed.

19. PATHAK, M. D., and REGINALD H. PAINTER, Differential Amounts of Material Taken Up by Four Biotypes of Corn Leaf Aphids from Resistant and Susceptible Sorghum Plants.

Measurement was made of the differential amounts of plant material taken by individual aphids of the four corn leaf aphid biotypes from resistant and susceptible plants. All 4 biotypes gained significantly more weight on susceptible plants than on resistant plants. Weight loss on resistant plants was significantly less than the loss when aphids were kept without food. Biotype KS-2 took more food from the resistant plant, Piper Sudan 428-1, than did other biotypes. KS-2 also had the highest fecundity of any of the biotypes on 428-1 but not on the generally susceptible variety, White Martin. The aphids took some food from the resistant plants after being kept overnight in the absence of food but lost weight later. The amount of plant material taken by different biotypes from resistant plants was correlated with their fecundity on such plants. In contrast, on susceptible plants the biotypes taking in the most material reproduced the least.

20. PATHAK, M. D., and REGINALD H. PAINTER, The Feeding Effects of the Four Biotypes of Corn Leaf Aphids on Susceptible Sorghum and Barley Plants.

Five plants of White Martin sorghum and Spartan barley were grown separately in each of five pots. Thirty apterous adults of each of the four biotypes were caged on the plants in four of these pots leaving the fifth one as a control. The heights of the plants, dry weights of the tops and dry weights of the roots were recorded at the end of one month.

No appreciable difference in the fecundity of these biotypes was recorded on either of these hosts. Biotype KS-1 caused the highest damage to White Martin plants while KS-4 was the least destructive. On Spartan plants biotype KS-4 caused the maximum damage. Biotype KS-2 caused intermediate damage to both hosts. All the biotypes caused more damage to roots than to tops of both hosts. There were considerable differences between the four biotypes on the same, as well as different hosts.

21. DICKSON, R. C., Four Years With the Spotted Alfalfa Aphid.

The spotted alfalfa aphid was the third Therioaphidine species to be introduced into North America from Eurasia. It is the member of the group that generally infests *Medicago* clovers. Populations were very high when it was first introduced making it a severe pest. Parasite introduction has helped indigenous biological factors establish a condition approaching equilibrium, so that we may expect that in the future the spotted alfalfa aphid will be a pest only periodically.

22. YOUNG, WILLIAM R., and RAFAEL A. PADILLA, The Spotted Alfalfa Aphid, *Therioaphis (Pterocallidium) maculata* (Buckton) in Mexico.

Since 1954, when the spotted alfalfa aphid was first reported in northern Mexico, the infestation has spread south more than one thousand miles to Oaxaca, Oax. and now covers all of the major alfalfa producing regions of the Republic. The results of investigations with this species conducted at Chapingo, Mexico and La Piedad, Michoacan, in high altitude regions typical of much of the alfalfa pro-

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ducing area of the country, indicate that most severe damage from the aphid can be expected in the spring cuttings when the population increases rapidly with the rising temperatures. At this time, when the predator populations develop too slowly to prevent the typical aphid injury to the crop, economic control has resulted from one application of BHC, parathion, malathion, or DDT plus toxaphene, which are being recommended pending the results of a project underway to develop alfalfa varieties with tolerance to this pest.

23. WILSON, M. CURTIS, and RALPH L. DAVIS, Development of an Alfalfa Resistant to the Meadow Spittlebug.

Purdue Synthetic F alfalfa, assigned the number A600, by the Alfalfa Improvement Conference has been developed for resistance to certain insects as well as for desirable agronomic qualities. Numerous field trials show that resistance to the meadow spittlebug found in three of its parent clones is transmitted. A600 is not immune, but has a high amount of resistance which is not found in any commercially grown alfalfa. This resistance appears to be of three types: antibiosis, tolerance, and possibly unattractiveness or non-preference.

24. BREELAND, S. G., Winter Studies on the Armyworm, *Pseudaletia unipuncta*, in Tennessee.

Results are presented of overwintering studies based on individual rearing records of more than 200 armyworm larvae. The species was observed to overwinter successfully in the partly grown larval stage. Overwintering in Tennessee is accomplished as a result of retarded development in the various larval instars. There is no true hibernation since larvae resume activity during warm periods of winter. Overwintering larvae were collected in the field during each month of the study, October, 1956 through March, 1957.

25. CALLAHAN, PHILIP S., A Possible Correlation Between the Fat Content and the Reproductive Patterns of *Pseudaletia unipuncta* and Migration.

The amount of fat body and percentage of mating of populations of the armyworm from various latitudes may indicate whether or not migration of the imago is in progress.

26. WALTON, R. R., and JAMES R. GIFFORD, Preliminary Studies on the Biology and Control of the Red-Necked Peanutworm, *Stegasta bosqueella* (Chambers), on Peanuts in Oklahoma.

Outbreak infestations of this species developed on peanuts in Oklahoma for the first time in 1957. All fields examined showed 50 to 100% damaged shoots. The first generation apparently began in early July and the growth of the young crop was greatly retarded for a period of at least two weeks. Larvae of the second generation appeared in most fields by July 24 and those of the third generation by mid-August. The duration of the egg, larval and pupal periods and the sites of oviposition, larval feeding and pupation were studied in a screen house and in the field. Pupation occurred in the soil and at leaf axils and in tunneled shoots above the ground. A considerable incidence of parasitism of the larvae by one or more hymenopterous species is indicated.

27. LIN, CHENG SHAN, The Biology of Philanthine Wasps.

The life histories of the following 4 species of Philanthine wasps have been observed and studied: *Aphilanthops frigidus*, *Philanthus bilunatus*, *P. gibbosus*, and *P. solivagus*.

The egg of *Aphilanthops frigidus* is laid on the thorax of a queen ant belonging to the genus *Formica*. The other 3 Philanthine wasps prey mostly on the mining bees (Halictidae), laying an egg glued to the abdomen of the last victim. The prey are completely paralyzed.

The development of these wasps is very much the same. The incubation period of the egg is 2-3 days, the larva feeding period is 5-7 days, and the period for spinning of a silken sac-like cocoon is about 2 days.

The larvae are typically fusiform. The body behind the head is 13-segmented, cylindrical-shaped, tapering on both ends. A full grown larva ranges from 15 mm to 20 mm in length. A comparative study of the morphology of these larvae also has been made.

28. SNOW, W. E., EUGENE PICKARD, and J. L. HAWKINS, Observations on the Biology of *Psorophora cyaneescens*.

Field investigations in the Tennessee Valley region have shown *Psorophora cyaneescens* to survive readily in intermittently flooded grassland pools, sink holes, and seeps. Rapid larval development appears to be an important factor in competing with *Psorophora confinis* and *Aedes vexans*. Preferred oviposition sites were at lower contour elevations. Adult activity was mainly nocturnal and near ground level. Unlike most *Janthinosoma* in the region, adults were more common in grassland than in forested situations.

29. RANDOLPH, N. M., and B. B. GILLESPIE, Notes on the Biology of the Vetch Bruchid, *Bruchus brachialis* Fahr.

Some observations of the spring activity and egg laying habits of the overwintering bruchid. Length of immature stages are based upon measurements of head capsule of larvae and pupae removed from vetch pods and seeds at intervals throughout the vetch growing season. Adult males and females were isolated to obtain oviposition and hatching records.

30. LUGINBILL, P., JR., Resistance of Wheat Species to the Wheat Stem Sawfly.

Varieties representing twelve wheat species were grown at Choteau, Montana, in cooperation with Crops Research Division in an attempt to find new sources of resistant germ plasm for use in the breeding program. Thirty-nine varieties had satisfactory sawfly resistance and are considered to be new sources of germ plasm with sawfly resistance. Wheat varieties from species with 14 and 28 chromosomes were more resistant to sawfly cutting than those with 42 chromosomes. Sawfly resistance in the lower chromosome wheats was more stable under varying environmental conditions than in the higher chromosome wheats. Two types of resistance were apparently present in these varieties, resistance to sawfly oviposition and resistance to larval development within the stem.

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Section D: MEDICAL AND VETERINARY ENTOMOLOGY

1. HEWITT, R. I., E. WALETZKY, and W. P. JOHNSON, A New Organic Phosphate Effective Against *Hypoderma lineatum* and *H. bovis* when Administered Internally to Cattle.

American Cyanamid Compound No. 12,880: O,O-dimethyl-S-(N-methylcarbamoylmethyl) phosphorodithioate kills all three larval stages of *Hypoderma lineatum* in cattle when administered orally or intramuscularly in single doses (10-15 mg./kg.). This is about one-fourth to one-sixth of the doses (40-60 mg./kg.) which produce severe but nonfatal symptoms of cholinesterase inhibition. Similar low doses are also effective against second and third instar *H. bovis* and preliminary evidence from field trials indicates activity against the first instar of this species. Results from the first field trials, where treatment was initiated before migration of the larvae to the back had been completed, demonstrated that 1) the majority of the larvae (both species) which had not formed warbles were prevented from so doing, and 2) the majority of larvae which had pierced the back were dead at the first post-treatment (2 weeks) examination. No overt symptoms of toxicity were observed in these field trials following oral doses by drench or capsule of about 15 to 40 mg./kg.

2. BRUNDRETT, H. M., Bayer 21/199 As A Deterrent to Screw-Worm Attack in Sheep.

Screw-worm attacks are deadly to sheep and costly to stockmen. Infestations may occur anytime the air temperature is above 60°F. and there is an abrasion of the animal's skin.

Bayer 21/199 sprays applied at 0.25 and 0.50 percent strength to infested or wounded sheep gave excellent protection for 14 to 21 days. When sheared flocks were divided and half the flock was sprayed with 21/199 and the other half smeared with EQ-335, better protection against screw-worm attack was obtained by spraying. Of a total of more than 5,000 sheep, less than 1 percent of the sprayed sheep and more than 5 percent of the smear-treated sheep became infested with screw-worms.

3. GRAHAM, OWEN H., A Test With Bayer 21/199 for the Control of Cattle Grubs.

South Dakota cattle which had been exposed to infestation by *Hypoderma lineatum* and *H. bovis* were sprayed with three concentrations of Bayer 21/199 in November 1956. Groups of 16 yearlings were treated with 0.25, 0.5, and 0.75 percent of the insecticide, while another group of 16 untreated animals was used as a control. An average of 44 grubs per animal appeared in the backs of the untreated controls, while 46 of the 48 sprayed animals were grub-free.

4. ROBERTS, R. H., and R. D. RADELEFF, Bioassay of the Blood from Cattle Treated with American Cyanamid Compound No. 12,880.

American Cyanamid Compound No. 12,880, an organophosphate having systemic action, was administered to cattle by several routes. Blood was taken from the animals at stated intervals following treatment and bioassayed, using the stable fly as the test organism. The levels found by this method are compared to those determined radiometrically using P³²-labeled 12,880.

5. KNAPP, FRED W., and HERBERT KNUTSON, Reproductive Potential and Longevity of Two Isolated Field Populations of Insecticide-Susceptible House Flies.

Ellsworth, Kansas house flies laid more eggs early in life than Wilmore, Kansas house flies, partly because of (1) more eggs per adult female fly-day, but largely because of (2) a lower adult mortality during the 4 to 9 day period of the adult parents' lives. Wilmore flies, eventually, almost caught up in egg production because they excelled in these two respects, especially in eggs per adult female fly-day, during the remainder of the adult parents' lives.

Hatchability rates were similar, but the Ellsworth progeny underwent greater average mortalities from larva to pupa, and from pupa to adult.

The resulting adult progeny of the Ellsworth parents was less than half that of the Wilmore parents, because of higher survival rate from egg to adult of Wilmore eggs laid during the (1) 2 to 3 day period, and (2) 10 to 18 day period of the parents' lives, which was when a substantial portion of the Wilmore eggs were laid.

6. LABRECQUE, G. C., H. G. WILSON, and J. B. GAHAN, The Development and Status of Resistance to Organophosphorus Compounds in House Flies in Florida.

The status of resistance to organophosphorus compounds was determined in 13 strains of house flies collected throughout central and southern Florida. All colonies were exposed to contact sprays and some were also tested against malathion in baits and as residues on plywood panels. The flies from the poultry houses of southern Florida showed the greatest degree of resistance, up to 130X greater than normal flies to malathion, 70X to Dipterex, 18X to parathion, and 34X to Diazinon when compared at the LC-50. Flies from the dairy barns of the same area exhibited a lower degree of resistance; >40X to malathion, >16X to Dipterex, about 8X to parathion, and 5 to 10X to Diazinon. Resistance was not so pronounced in flies from the central portion of Florida where in poultry houses malathion resistance ranged from 20 to 35X. In dairy barns, however, malathion resistance was low, ranging from 3.2 to 6.4X. In one instance Dipterex resistance was greater than 16X.

7. HOWELL, D. E., Control of Flies on Dairy Animals with Repellents.

Carefully balanced lots of cattle were sprayed with various formulations of repellents and toxicants and compared with a standard containing pyrethrins and piperonyl butoxide. Both emulsions and oil solutions were used. Fly population counts were made at regular intervals to determine duration of protection. Materials tested included 2, 3, 4, 5-bis(2-butylene) tetrahydrofurfural, (MGK R 11), di-n-propyl isocinchomeronate, (MGK R 326), di-n-butyl succinate (Tabutrex), and other more recently developed repellents used with and without synergists. Most repellent formulations tested provided better protection than the standard.

8. KILPATRICK, JOHN W., and H. F. SCHOOF, House Fly Control Studies on Savannah, Georgia, Farms.

Residual treatments of DDT, DDT:EPN, Dylox, Korlan, Guthion, and Allied Chemicals No. 3707 were applied to dairies in the Savannah, Georgia, area during the 1957 fly season. Dylox and Korlan at

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dosages of 200 mg./sq. ft. provided the longest and most effective fly control of the materials tested. Diazinon, parathion, or Korlan impregnated cotton cords installed in dairy barns or chicken ranches continued to show highly effective fly control for extended periods of time.

9. OGDEN, LOUIS J., and JOHN W. KILPATRICK, Fly Control in Utah Dairy Barns.

Fly control studies were made in dairy barns in the Logan, Utah, area using experimental parathion:Diazinon impregnated cotton cords of 3/32" diameter. Excellent to satisfactory extended control of *Fannia canicularis*, the predominant species, was obtained within one week after cord installation in dairy barns and animal sheds at dosages of 30 feet of cord per 100 square feet of floor area. Lesser populations of *Muscina* species and *Stomoxys* species were only partially controlled. Poison baits containing malathion and DDVP failed to attract or control *F. canicularis*.

10. LANCASTER, J. L., JR., Control of Biting Flies Attacking Cattle.

Commercial automatic sprayers, back rubbers, and hand spraying have been used as methods of applying insecticidal-repellent mixtures. More recently a treadleless automatic compressed air sprayer has undergone extensive tests and was found to be satisfactory.

Methoxychlor, methoxychlor and butoxypolypropylene glycol, di-n-butyl succinate, meta-Delphene, Thanite, R11, R326, and synergized pyrethrins have been used in tests of effectiveness. Results of tests are presented.

11. HARGETT, L. T., and E. C. TURNER, JR., Horn Fly Control by the Use of Dusts in Self-Applicating Devices.

Bayer 21/199, chlordane and toxaphene dusts were used in cable-type backrubbers for horn fly control on beef cattle. Bayer 21/199 and methoxychlor dusts were also used in special type backrubbers for horn fly control on dairy cattle. Backrubbers treated with insecticides diluted in oil were used as a standard. The data obtained demonstrated that these materials in a dust form may be used successfully in self-applicating devices for the control of horn flies on beef and dairy cattle.

12. TURNER, E. C., JR., and L. T. HARGETT, The Effect of Residual Barn Sprays on the Control of Horn Flies.

Earlier work by several workers has indicated that residual barn sprays of Diazinon reduced the population of horn flies on dairy cows being brought into these barns for milking and feeding. It was desired to determine if this reduction of the horn fly population would last long enough to constitute an effective control measure. Also, it was desired to determine if other insecticides applied as residual sprays would result in a reduction of the number of horn flies on dairy cows.

The results indicated that Diazinon was very effective in controlling the horn flies for two to four weeks depending on the ventilation of the barn. Other insecticides that showed effective control for one to four weeks were lindane, Korlan, and Bayer 21/199.

13. ALFORD, G. HAROLD, Horn Fly Control With Bayer 21/199.

Approximately 5,000 cattle were sprayed with various concentrations of Bayer 21/199 in order to evaluate its effectiveness for the control of horn flies. Spray applications of one-half gallon per head of 0.25 percent wettable powder, 0.5 percent wettable powder, and 0.75 percent wettable powder gave good control for 4 to 7 weeks. Applications of 0.5 percent methoxychlor wettable powder gave good control for 2 to 3 weeks.

14. CHENG, TIEN-HSI, DONALD E. H. FREAR, and HENRY F. ENOS, JR., The Use of Treatments Containing Methoxychlor Against Biting Flies on Cattle and the Determination of Methoxychlor Residues in Milk.

Insecticide formulations containing 1% methoxychlor in combination with N,N-diethyl-m-toluamide, Thanite, butoxypolypropylene glycol, synergized pyrethrins and Lethane 384 were applied on dairy cattle by means of electric eye controlled sprayers. Daily applications were made at the rate of from 75 to 120 ml. per cow. The formulations provided excellent control of horn flies but less consistent control of stable flies and horse flies. Milk samples taken from treated animals showed that the concentration of methoxychlor increased to a maximum of approximately 0.10 ppm but dropped rapidly when applications were periodically suspended. Methoxychlor residues were also determined in milk taken from cows using cable-type back rubbers on which insecticides were applied.

15. DALMAT, HERBERT T., Arthropod Transmission of Rabbit Papillomatosis.

The virus of rabbit papillomatosis, a tumor disease studied intensively in relation to cancer because of its tendency for malignant transformation, was successfully transmitted from primary lesions of cottontail rabbits by *Aedes aegypti* and *Rhodnius prolixus* by interrupted feeding, feeding after an interval of several days from the infective meal, and by scarification of the mouthparts of the insects either immediately after their infective meal or several days hence. Transmission was also accomplished from the satellite tumors of two infected cottontails and from atypical vascular tumors of a domestic rabbit.

16. YOUNG, FRANK N., Arthropods Associated with the Pack Rat, *Neotoma albigula*, in Southeastern Arizona.

The lodges of the pack or wood rat, *Neotoma albigula*, form distinctive microhabitats in the desert and semidesert regions of the Southwestern United States. Investigations in Cochise County, Arizona, during the summer of 1956 indicate that many arthropods are characteristically confined to such situations during the dry periods of the year. Some of these are apparently unique, not having been taken in other situations. Several, including at least two species of *Triatoma* bugs, are of potential importance in public health. The appearance of triatomids in numbers at lights is correlated in several instances with abundance of pack rat lodges in the vicinity. Control has been attempted locally by ranchers through burning the nests using kerosene or gasoline.

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17. WINGO, CURTIS W., The Habits of *Loxosceles reclusus* as Related to Necrotic Arachnidism in Man.

Collections of *Loxosceles reclusus* show it to be closely associated with human habitation. The species has consistently been collected on and around the premises of persons suffering from necrotic arachnidism of which *L. reclusus* is presumed to be the agent in Missouri. This spider has been taken in outbuildings, cellars and basements, bedrooms, bathrooms and closets. Concentrations are found in infrequently disturbed storage areas. The species shows no aggressive tendencies. In rearing cages the egg sac with eggs or spiderlings can be freely manipulated without aggression from the female. Both sexes possess a necrotoxic venom which they can readily inject into the skin of mammals.

18. GRAHAM, A. J., and F. H. DUDLEY, Culture Methods for Mass-rearing of Screw-worm Larvae.

Screw-worm larvae were reared in sufficient numbers to produce 2,000,000 sterilized flies weekly for 15 consecutive weeks in a Florida field test. The equipment and techniques used in handling the fly colony, inducing oviposition, rearing larvae, and preparing pupae for irradiation are described.

19. HUSMAN, C. N., and A. H. BAUMHOVER, Mechanical Devices for Dispersal of Sterilized Screw-worm Flies from Aircraft.

In a Florida field test 2,000,000 sterilized screw-worm flies were distributed each week for 15 weeks over a 2,000 square mile plot. Pupae were placed in boxes after irradiation at the rate of 550 per box and an average of 500 flies emerged to be released as day-old adults. The boxes were modified one-pound frozen food cartons. These boxes were mechanically opened and dropped at the rate of 2 per mile from aircraft covering the area in mile swaths each week to release 500 sterile males (plus an equal number of sterile females) per square mile per week. A manually operated release device was first made for this work, but at the conclusion of the test an automatic device was developed which could be adjusted to open and drop boxes at any desired rate.

20. BAUMHOVER, A. H., C. C. SKIPPER, and W. D. NEW, Field Observations on the Effects of Releasing Sterile Screw-worms in a 2,000 Square Mile Area in Florida.

From May 1, 1957 through August 16, 1957 approximately 2,000,000 sterile screw-worms were released per week over a 2,000 square-mile area in East Central Florida. The method of sterilization and packaging is discussed along with observations on the effect on the natural screw-worm population as determined by egg mass collections and case incidence.

21. DRUMMOND, R. O., Laboratory Tests for Animal Systemic Insecticides.

The systemic insecticidal properties of candidate insecticides received at the Kerrville, Texas, Laboratory have been determined by the following short-term laboratory test. Guinea pigs infested with nymphal lone star ticks, *Amblyomma americanum* and screw-worm larvae, *Callitroga homivorax*, were treated orally and subcutaneously with the compounds. After treatment, stable flies, *Stomoxys calcitrans*, were fed on the guinea pigs. Compounds

which exhibited systemic insecticidal activity in these preliminary screening tests were often used in tests with sheep and goats. The compounds were administered orally to screw-worm infested sheep and goats to evaluate their systemic effect on screw-worms. In addition, stable flies and lone star ticks were fed on the treated goats. Schedules of the tests and results of nine compounds used in the guinea pig test and three compounds used in the sheep and goat test are presented.

22. HAZELTINE, WILLIAM, Chemical Resistance and Control of the Brown Dog Tick by Contact Insecticides.

Graphs are presented to show the differences in susceptibility of isolated populations to chlordane and lindane, and the method of testing given.

Results of chemical screening are given as LD50 values for a wide range of chemicals.

23. RAFFENBERGER, E. M., The Effects of Oral Doses of Dow ET-57 on Chicken Shaft Louse Infestations.

Single oral doses of DOW ET-57 caused the elimination of shaft louse nymphs and adults from laying hens. The re-establishment of populations was demonstrated. Incorporation of the insecticide in the daily rations showed palatability to be a limiting factor in the practical use of Dow ET-57 against chicken parasites.

24. KNAPP, F. W., and C. C. ROAN, Korlan as a Larvicide for Fly Control Under Caged Chickens.

Field experiments were conducted at Manhattan, Kansas, to determine the efficacy of Korlan and malathion as fly larvicides in chicken droppings under caged layers.

Preliminary experiments show Korlan to have given 95-99% control and malathion 0-37% control under the conditions of the experiment.

25. ANTHONY, DARRELL W., and DALE J. RICHEY, Influence of Black Fly Control Measures on the Incidence of *Leucocytozoon* Disease of Turkeys in South Carolina.

Experiments in Jasper County, South Carolina, showed that simuliid control measures followed by a severe drouth which further eliminated major breeding areas failed to reduce the incidence of *Leucocytozoon* infections in turkeys. Members of the Simuliidae are the only known vectors of this protozoan parasite but these studies suggest that other insects in addition to black flies may serve as vectors.

26. KILPATRICK, JOHN W., RICHARD W. FAY, and JAMES T. BAKER, The Rearing and Radioactive Tagging of *Fannia canicularis*.

Adults of *Fannia canicularis* were allowed to feed for 24 to 48 hours on cotton pads saturated with milk or honey water containing concentrations of 0.5, 1.0, 2.0, 2.5, and 5.0 millicuries P^{32} /liter. Measurement of radioactivity at daily intervals after feeding showed that *F. canicularis* could be satisfactorily tagged for a period of 10-12 days with either honey water or milk containing 2.0 or 2.5 millicuries P^{32} /liter. Feeding for 48 hours was not considered necessary. Dosages of less than 2.0 millicuries P^{32} /liter provided insufficient activity.

A technique for rearing *F. canicularis* using a standard CSMA media with twice the normal volume

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of water, was devised. The method provided unlimited production of adults, the cycle from egg to adult requiring 14 days. Tightly-rolled corrugated cardboard placed over the rearing medium provided a highly satisfactory pupation site.

27. HOFFMAN, ROBERT A., Results of Laboratory Tests on the Toxicity of Several Insecticides to *Chrysops* Larvae.

Of 20 chemicals tested, parathion was the most toxic, producing 100 percent mortality at 5 p.p.m. Lindane gave the highest mortalities among the chlorinated hydrocarbons and Lethane and toxaphene were the least effective.

28. THORSTEINSON, A. J., A Thermal Trap for Tabanids and Other Diptera.

A simple trap was designed and tested in areas infested with tabanids. Considerable numbers of tabanids and other Diptera were caught in the trap, apparently attracted by heat generated by the greenhouse principle. Neither chemical nor optomotor lures were used. As the trap is inexpensive, portable and efficient, it may be useful in control as well as in ecological and taxonomic investigations.

29. BRELAND, OSMOND P., A Report on *Haemagogus* Mosquitoes in the United States.

The objectives of this paper are several. First, to report the percentage of *Haemagogus* mosquitoes recovered from hundreds of collections of tree-hole breeding mosquitoes; second, to suggest factors that may influence the activities of these mosquitoes; and third, to indicate features by which *Haemagogus* larvae may be distinguished from the larvae of other tree-hole breeding insects most likely to be associated with them.

30. CRAIG, GEORGE B., JR., Parthenogenesis in *Aedes aegypti* (L.).

In the course of a program for development of mutant strains in *Aedes aegypti*, embryonated eggs were produced by certain virgin females. For example, from 2500 eggs deposited in a cage containing 300 virgin females, a single larva hatched and developed into an apparently normal adult male. When crossed with a normal female, this male gave rise to normal offspring in the usual sex ratio. Parthenogenetic development in eggs from our laboratory strain has occurred on eight occasions, giving rise to eleven males. Attempts to detect parthenogenesis in other strains, involving observation of about 1500 females, have been unsuccessful. Parthenogenesis is rare among the Diptera and has not been reported in mosquitoes.

31. GILLHAM, NICKOLAS W., and GEORGE B. CRAIG, JR., Genetic Basis of Larval Pigmentation in *Aedes aegypti* (L.) (Diptera: Culicidae).

In laboratory colonies of *Aedes aegypti* the larvae are usually dark in color, but yellow individuals often occur. Color is caused by the deposition of dark granules in the fat body while the yellow phenotype is produced in the absence of these granules. Separate strains of black and yellow larvae were isolated and inbred. Both strains bred true for their respective colors. Crossing experiments indicate that black and yellow are caused by a single pair of alleles. Black is dominant to yellow and the alleles are autosomal. Yellow phenocopies can be produced in the heterozygote by crowding or improper feeding. Among seven strains investigated the frequency of the yellow phenotype varied from 1 to 100%.

32. JONES, JACK COLVARD, A Test for Detecting Dieldrin Tolerance in *Anopheles* Mosquitoes.

Larvae and pupae of *Anopheles quadrimaculatus* were exposed for graded periods to a single massive dose of dieldrin in fresh acetone-water preparations, then were thoroughly rinsed and observed daily until death.

Following a ten-minute exposure of larvae to 5 p.p.m. dieldrin, the number of adults emerging varied from 32% (random third stage larvae), 41% (for ± 36 hour fourth stage larvae), to 64% (for ± 60 hour old fourth instars). The 24-hour mortality point is shown to be an unreliable index to eventual mortality because of latent effects of dieldrin. This is dramatically shown by exposing pupae for 15 minutes to dieldrin: more than 50% of them emerge successfully as adults in 1-2 days but then approximately 50% of those that emerge die on the first day of adult life (versus less than 10% of the controls dying on the first day of adulthood).

33. CRAIG, GEORGE B., JR., Development of Resistance to Insecticides in *Aedes aegypti* (L.) Through Larval Selection.

Larvae of ten field and laboratory strains were tested against five insecticides to determine normal tolerance levels for the species. To develop high levels of resistance, a DDT-resistant strain from Trinidad was subdivided into several lines and larvae of these lines were selected with DDT, dieldrin or malathion. After thirteen generations of selection with DDT, larvae were no longer affected by this material at any concentration and adults were also highly resistant. Intense selection was more effective than moderate selection. A line maintained without selection lost most of its resistance. Selection with dieldrin developed a moderate resistance to dieldrin but malathion selection did not develop any increase in tolerance. No indication of cross-resistance among the various categories of insecticides was detected. A DDT-susceptible strain was selected with DDT for five generations with no increase in resistance.

34. WOODRUFF, ROBERT E., Mosquito Control in Kentucky with Special Reference to *Aedes sollicitans*.

Two factors have greatly influenced and increased the interest in mosquito control in Kentucky in recent years. Outbreaks of St. Louis encephalitis and the control of its vector, *Culex pipiens*, are the prime concern. The first major outbreak of this disease in recent years was in Calvert City, Kentucky in 1955 where in a town of approximately 1500 population, 15 cases were reported. In 1956 outbreaks were reported from Fulton and Louisville with over 100 cases. Only 2 cases have thus far been reported in 1957.

The second problem is that of the occurrence of the salt marsh mosquito, *Aedes sollicitans*, in the strip mining regions of Western Kentucky. This species was not reported for Kentucky as late as 1944, but in recent years has built up considerable populations in 3 Western Kentucky counties. Emergency funds have been set up under the State Department of Agriculture for use in mosquito control.

35. GOUCK, H. K., CLAUDE H. SCHMIDT, and I. H. GILBERT, Evaporation of Repellents from Skin and Cloth.

Dimethyl phthalate and diethyltoluamide were applied to measured areas of the forearm of a human subject, the shaved ventral surface of a guinea pig, or a swatch of cloth. The treated surfaces were confined in glass vessels that were connected to a system

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of traps containing ethanol. An air stream was passed through the system at a constant rate, and the amount of repellent collected in the traps in 2 hours was determined by ultraviolet spectrophotometry. Dimethyl phthalate evaporated at twice the rate of diethyltoluamide. With both repellents the evaporation rate was highest from guinea pigs, less from the forearm, and least from warmed cloth.

36. SNOW, W. E., and EUGENE PICKARD, Prevalence of Adult *Mansonia perturbans* in Pastured Lowland.

Field tests to determine prevalence of *Mansonia perturbans* in pastured lowland by use of human subjects were made in twilight activity periods over a 1.0-0.2 footcandle range. Supplemental trapping methods were used with captures of biting mosquitoes to account for non-feeding mosquitoes about the collectors. Records from six tests showed that the number captured by aspirating plus drop net was far superior to aspirating with terminal net sweeps. Parked car collections were about as efficient as net sweeping for capture of female mosquitoes.

37. SCHMIDT, CLAUDE H., and D. E. WEIDHAAS, Uptake of P^{32} -labeled Insecticide by *Anopheles quadrimaculatus* Larvae.

Fourth-instar *Anopheles quadrimaculatus* larvae were exposed to various concentrations of P^{32} -labeled insecticide to study the amount absorbed. Larvae were exposed for 24 hours to water suspensions of the chemical, mortality counts were taken, and the larvae and water suspensions were assayed for insecticide content. The average amount per larva absorbed at each concentration was determined, and the relationship between the concentration and the amount absorbed was established. Larvae surviving exposure to the LC-50 were compared for uptake of insecticide with those that were killed at this same concentration.

38. EADES, JAMES, ROBERT JULIAN, JAMES STREET, DON W. MICKS, and DONALD DUNCAN, Electron Microscope Studies on *Plasmodium cathemerium*.

With the objective of visualizing as many stages in the life cycle of a malaria parasite as possible, studies to date have resulted in good pictures of the blood forms, and of oocysts between 3 and 10 days of age. The blood forms so far encountered have not differed materially from those reported by Rudziniska and Trager for *Plasmodium lophurae*, in ducklings. The earliest oocysts examined, 3 days, are very opaque to the electron beam. Only in the most favorable sections is it possible to see a number of nuclei, mitochondria and an abundance of endoplasmic profiles. All later stages, including the sporozoites, show these features. Oocyst cytoplasm is separated from mosquito cell cytoplasm by a relatively thick, structureless membrane of moderate density. Since this membrane blends without interruption with a similar structure limiting the outer wall of the mosquito stomach, it is considered a product of the mosquito. The initial high density of the oocyst and the presence of the thick surrounding membrane suggest that the parasite depends largely on the avian host as a protein source.

39. VENARD, CARL, Additional Observations on Protozoa of the Family Vorticellidae Infesting Mosquito Larvae.

Mosquito larvae of woodland pools in the vicinity of Wooster, Ohio were studied in April and May of 1957. When *Aedes stimulans* was in its second instar and large populations were present in all pools, these

pools were easily classified into (1) pools where no infested larvae were found, (2) pools where few lightly infested larvae were found, and (3) pools where almost every larva was heavily infested. Later, pools of type three had very few third and fourth instar larvae whereas pools of types one and two had large populations of these instars.

40. WOKE, PAUL A., Organic Stimulants to Egg-hatching in *Haemagogus equinus* Dyar.

Between 85 and 96% of the eggs of *Haemagogus equinus* were induced to hatch by use of two commonly available materials, a suspension of brewers' yeast, and a mixture of brewers' yeast and an extract of pupae of *Aedes aegypti*. Most hatching occurred within 24 hours after initial exposure. A concentration of 0.3 grams of yeast per liter of distilled water was superior to higher or lower concentrations. No significant difference in effect as a hatching stimulant was shown between concentrations of the extract of eight pupae per ml. and 1/8 pupae per ml. Egg-hatching was good also in extracts of maple tree leaves.

Section E—Subsection b

Section E: CONTROL EXTENSION AND REGULATORY ENTOMOLOGY

Subsection b, Plant Pest Control and Quarantine

1. O'DELL, W. V., The Gypsy Moth Situation in 1957.

The problems of controlling the gypsy moth in the northeast and preventing spread to other sections of the country was aggravated by a serious and unprecedented outbreak of the pest in 1953. Subsequent surveys showed extensive spread involving more than 10 million acres of newly infested territory. Cooperative State and Federal activities to prevent further spread and to eliminate peripheral infestations accelerated in 1956 and greatly expanded in 1957. Approximately 4 million acres have been aerially sprayed with DDT since inauguration of the elimination program. In the summer of 1957 more than 15 million acres of territory were surveyed with sex attractant traps to detect outlying infestations. An infested area involving several townships was recently detected by trapping in northeastern Pennsylvania. Parasites and other natural control factors contributed to low incidence of defoliation in 1957 throughout the generally infested area of New England and eastern New York.

2. PADGET, L. J., The Khapra Beetle Program in the United States and Mexico.

The khapra beetle, *Trogoderma granarium*, a serious pest of stored products, was found in the San Joaquin Valley of California. The insect was subsequently found in Arizona, New Mexico and Baja California, Republic of Mexico. The U.S.D.A. in cooperation with the states concerned and the Department of Agriculture of Mexico are engaged in a program to eradicate the pest from the North American Continent. This paper is a report on the methods used to accomplish this end and the progress made. The program is apparently drawing to a successful end.

3. CRONIN, T. C., Status of Japanese Beetle in the United States.

This is a report on the known occurrence of the Japanese beetle in the United States, and the cooperative survey, control, and regulatory program.

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4. ROHWER, G. G., Eradication of the Mediterranean Fruit Fly.

The second invasion in the United States of the Mediterranean fruit fly was found at Miami, Florida, April 13, 1956. The previous infestation of 1929-1930 was successfully eradicated, principally through host destruction. A State-Federal program is being conducted to locate and delimit infestations, prevent spread, and eradicate the pest, principally through the use of insecticides.

5. KELLEY, J. W., II, Witchweed—A Parasite on Roots of Corn and Some Grass and Grain Plants.

Witchweed (*Striga asiatica*) is a destructive parasitic plant on roots of corn, sorghum, sugarcane, crab grass and other plants of the grass family. It is widely distributed in tropical and subtropical areas of the Old World. First found in the United States in 1956, it is now known to occur in 10 counties in southeastern North Carolina and six contiguous counties in South Carolina. A Federal quarantine has been issued to restrain distribution to other areas. A Federal-State survey is underway to delimit the areas of infestation.

6. LANIER, T. J., The Establishment of the Soybean Cyst Nematode Identification Laboratory at Memphis, Tennessee.

The soybean cyst nematode, *Heterodera glycines*, Ichinohe, which causes severe damage to soybeans and which was previously known only in the Orient, was found in New Hanover County, North Carolina, in 1954. In 1956 this pest was found in the heavy soybean producing areas along the Mississippi River, which resulted in an intensive survey to determine its distribution.

The identification of the soybean cyst nematode is very difficult and complex in that morphological measurements have to be made to distinguish it from closely related species. For this reason, together with the fact that surveys were to be conducted in all soybean growing states, a soybean nematode identification laboratory was established April 29, 1957 in Memphis, Tennessee. This paper reports a summary of the procedures and identification techniques employed at the Soybean Cyst Nematode Laboratory and of the progress made through November 1, 1957.

7. PATTON, J. W., Spreading Decline of Citrus.

The disease Spreading Decline, caused by the burrowing nematode, is one of the most serious threats to the Florida Citrus Industry. A cooperative State-Federal program is being conducted to locate infestations, prevent further spread, and eradicate the nematode from commercial citrus groves, principally through soil fumigation.

8. BITTNER, F. D., Pink Bollworm Control Through the Destruction of Wild Cotton.

Destruction of wild cotton, principally by pulling up the plants, is carried on in 11 coastal counties of Florida to prevent the build-up and dissemination of the pink bollworm to the cotton-producing areas in Florida and other states. Field tests are under way to determine other effective means of control. Much of the area involved is accessible only through the use of boats.

9. BLASINGAME, W. E., State-Federal Cooperative Control Programs.

The speed with which new pests of foreign origin are being detected in this country indicates a need for an acceleration of the control eradication phase of plant quarantines and a clearer understanding of long range program objectives.

10. MONRO, H. A. U., Soil and Building Fumigation Treatments with Methyl Bromide to Suppress the Oriental Fruit Moth in the Okanagan Valley, British Columbia.

As the result of an apparent failure of a quarantine fumigation at the point of origin, living larvae of the oriental fruit moth in truckloads of peaches were introduced in the fall of 1956 into one cannery, and possibly another, in the Okanagan Valley, B. C. Before the insect was identified, debris from the infested peaches in the first cannery was dumped in an eight acre orchard. A campaign of suppression was conducted in the early spring of 1957. The two canneries were fumigated under plasticised tarpaulins in routine procedures. In the orchard the trees were removed, with one foot of stump left above ground level. The plasticised tarpaulins were supported by these stumps and by a number of orchard boxes distributed between them.

Problems encountered in the successful completion of the orchard fumigation included low soil temperatures, high winds, heavy sorption of the fumigant by organic matter in some sections of the orchard, and considerable losses of gas by diffusion through rocky and sandy soil in others.

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Section F: CHEMICAL CONTROL INVESTIGATIONS

1. SMITH, EDWARD H., Relative Effectiveness of Dormant and Summer Control of the European Fruit Lecanium on Prune.

Dormant treatments included petroleum oils ranging in viscosity from 59 to 106 seconds (Saybolt, at 100°F.). Within this range there was no significant difference in effectiveness. While control of 90-95 percent was achieved with 2% oil based on counts of overwintering scales, the survivors gave rise to sufficient numbers of nymphs to cause fruit smutting before harvest. By contrast, a number of phosphate insecticides applied shortly after hatching reduced population to non-injurious levels. Based on these findings, it is concluded that summer control is more effective than dormant control. Where dormant control is employed, lighter oils can be used with no reduction in effectiveness.

2. WYLIE, W. D., Single Application Sprays for Peach Tree Borer Control.

Excellent control of peach tree borer has been obtained in Arkansas with a single application of a relatively high concentration of dieldrin. BHC appeared to be a little less effective. Any danger of insecticide residue on the fruit was eliminated by using low pressure or by applying the sprays with small compressed air sprayers.

3. SKELTON, T. E., and J. H. COCHRAN, The Peach Tree Borer in South Carolina.

Trunk sprays of various insecticides were applied during the summer months for control of the peach tree borer. The most effective materials used were

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parathion and Thiodan. Diazinon, Trithion, DDT, and Parascalecide did not provide acceptable control.

Studies of adult emergence indicated that the adult moths emerge from May until October, the highest emergence being noted between late July and mid-September.

4. SNAPP, OLIVER I., Poor Control of the Peach Tree Borer in the Fort Valley, Georgia Area from Trunk Sprays.

Trunk sprays of DDT, parathion and benzene hexachloride gave poor protection in preventing infestation of peach trees by the peach tree borer in heavily infested orchards at Fort Valley, Georgia, during the period 1951-56. The poor results from trunk sprays are believed to be due to the long oviposition period of the insect in this latitude. Moths have been observed in peach orchards as early as April 25 and eggs in the orchards have been known to hatch as late as December 7. The spread of the usual three or four trunk sprays per season is not sufficient for the emergence season in heavily infested orchards at Fort Valley, Georgia. Ethylene dichloride emulsion gave very good control of the peach tree borer in the same orchards in which the trunk sprays were tested during the period 1951-56.

5. HAMILTON, D. W., and JACK E. FAHEY, Value of Tree Trunk Sprays in Killing Codling Moth Larvae.

Screening tests conducted from 1955 through 1957 showed that parathion, Guthion and Diazinon were effective insecticides for killing mature codling moth larvae that were preparing to cocoon. Sevin and endrin were not entirely effective. In field tests parathion and Guthion were equally effective immediately following spray applications. As deposits aged, parathion maintained its effectiveness better than Guthion. Studies show that residues of parathion and Guthion persist on sprayed tree trunks at higher levels than on foliage.

6. CLEVELAND, M. L., Field Studies in the Control of Orchard Mites.

The effectiveness of early season miticides against the European red mite, *Metatetranychus ulmi*, and the effectiveness of summer miticides against both European red mite and two-spotted spider mite, *Tetranychus telarius*, were studied. Seventeen schedules were used in early season tests and 12 in the summer series. The miticides tested were 100 viscosity oil, Tedion, Genite, Chlorbenside, demeton, Thimet, ovex, Dow M-928, Chipman R-6199, scradan, and Fensone as early season miticides; Trithion, Aramite, Thimet, demeton, Guthion, Chlorobenzilate, ovex, Chipman R-6199, Dow M-928, Kelthane, Niagara 1240, and Delnav (Hercules 528) as summer miticides. All early season miticides except the dormant oil schedule were effective in controlling European red mite for at least 60 days after petal fall. In the summer series Chlorobenzilate, Delnav, Guthion, and ovex gave excellent control for at least 30 days after application. Dow M-928 was less effective when used in a single application. None of the materials tested exhibited any phytotoxic effect on the fruit or foliage.

7. BOWMAN, J. S., and J. E. CASIDA, Problems Associated with the Possible Use of Systemic Insecticides in Cocoa Production.

Many insects reduce the efficiency of cocoa production including the mealybug transmitters of the

swollen shoot virus. Studies were conducted at Turrialba, Costa Rica on the translocation, residues and efficiency of several systemic insecticides.

8. DOWDY, ALFRED C., "All-Purpose" Fruit Sprays.

The 1957 season was the third consecutive season during which "All-Purpose" fruit sprays were evaluated on a grower-trial basis in Michigan. Various dust and spray formulations and several pieces of spraying and dusting equipment suited to back yard plantings were included in the 1957 program. Cooperation in achieving several objectives of the program was carried on between research and extension personnel of four subject-matter departments and county extension agents, Michigan State University. Some 15 commercial formulations, 8 experimental insecticide-fungicide combinations and 10 different types of application equipment underwent trial. Most outstanding chemicals tested to date include insecticides, Sevin, malathion, and methoxychlor; and fungicides, Cyprex, captan, ferbam, and glyodin. Advantages and disadvantages of various chemical mixtures applied as sprays and/or dusts are summarized. Desirable application equipment is reported upon.

9. HAINES, R. G., Biological Observations and Chemical Control of Certain Strawberry Insects.

In Michigan many strawberry plantings are perennially infested with meadow spittlebug and a complex of leaf rollers. Of the latter pests the obsolete-banded leaf roller, the strawberry leaf roller and the red-banded leaf roller are commonly found. Observations on life cycles of these pests, effect of weather on development, and economic importance of control measures are presented.

Two years' data of tensive field tests with various new pesticides will also be presented. Combination control of leaf-rollers and spittlebugs with single applications of certain materials will be highlighted and emphasized.

Flavor tests and residue data in addition to comparison control evaluation of Guthion, Sevin, Trithion, Delnav, Thimet, Diazinon, Compounds 1189, 1240, and 12008 and standard insecticides indicate that new recommendations for strawberry insect control may be possible.

10. SHAW, J. G., and SANCHEZ R. MANUEL, Soil Toxicants for the Mexican Fruit Fly.

Results 289 and 400 days after soil treatment show endrin to be a highly effective toxicant with dieldrin and heptachlor next in effectiveness. The tests made in field cages show that the toxicants used as emulsions were more effective than when used as wettable powders. Compared to initially highly effective results with emulsions, the maximum effectiveness with granular formulations is delayed several months.

11. GREEN, H. B., and ROSS E. HUTCHINS, A Progress Report on Imported Fire Ant Studies in Mississippi.

Three tests were started using one acre size plots with three replications. Mound counts on plots were made before treatments were applied. One test was designed to compare .5, 1, and 2 pounds of dieldrin per acre applied in spring, summer and fall. Another test with twenty treatments was designed to compare methods of application and various materials: one pound of dieldrin applied as spray, granulated, and fertilizer mixture, with fertilized and unfertilized check, both disked and undisked, 1

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pound dieldrin on A and AA granules, 2 pounds dieldrin granules, 1 pound heptachlor spray, granules, and fertilizer mixture, 1 pound aldrin granules, 1 pound thiodan granules, 10 pounds toxaphene spray and granules. A third test compared airplane vs. ground application of 1 pound dieldrin with and without mound leveling. Food and bait studies have shown this ant to depend largely on other insects for food. Attractant additives for bait were found to show promise.

12. DOANE, J. F., and R. K. CHAPMAN, Onion Maggot Resistance to Chlorinated Hydrocarbon Insecticides.

The onion maggot, *Hylemya antiqua*, which often severely damages onions grown in Wisconsin, has been satisfactorily controlled with several chlorinated hydrocarbon insecticides since about 1950. Extensive tests from 1950 to 1952 showed that heptachlor, dieldrin, aldrin and chlordane all gave excellent economic control of the onion maggot with parathion giving good but slightly less efficient control than the above-mentioned materials. In 1957 poor control was obtained by growers with standard aldrin-fertilizer applications and heptachlor and dieldrin sprays. Control trials in these areas, where high populations of all stages of the onion maggot were present, showed that even high applications of such materials as heptachlor, dieldrin, aldrin and chlordane completely failed to protect the onions from maggot damage. Parathion and other phosphates, however, gave good stands even though the onions were under extremely high population pressures. These tests indicate that populations of onion maggots which are extremely resistant to several chlorinated hydrocarbon insecticides are present in at least some areas of Wisconsin.

13. WOLFENBARGER, DAN, and E. T. HIBBS, Onion thrips, *Thrips tabaci* Lind., Infesting Cabbage.

Thrips infestation of cabbage has recently become an acute problem in commercial plantings along the Mississippi River. The infestation was most often initiated at heading. Feeding scars permeating internal leaves turn brown destroying the market value of the crop at harvest. *Thrips tabaci* has been predominant, and three species of *Frankliniella* also have been identified. Usual spray schedules for cabbageworm control were ineffectual in preventing thrips damage. Heptachlor, parathion, and dieldrin were the most effective compounds in small-plot tests in 1956. Heptachlor on a weekly or bi-weekly schedule in 1957 was superior to DDT, toxaphene, perthane, or parathion on the same schedule. Parathion on the weekly schedule was nearly as good as heptachlor on the bi-weekly schedule.

14. WOLFENBARGER, D. O., Serpentine Leaf Miner: Brief History and Summary of a Decade of Control Measures for It in South Florida.

In the early days of vegetable crop production, previous to 1946, a few leaf miners were observed in the leaves, according to comments of growers and others. In 1946 inquiries were made by growers concerning the serpentine leaf miner, *Liriomyza pasilla* and experiments showed that chlordane was an effective control. In 1947 and 1948 very severe injuries were sustained by potato and tomato plants and control efforts were made by growers. Experiments have been conducted since 1946 to determine the most effective treatments for reductions of leaf miners. Certain chlorinated hydrocarbons in early tests ap-

peared to give satisfactory control but later were ineffective. Certain phosphatic insecticides were found very effective and have been used extensively.

15. RAWLINS, W. A., Onion Maggot Control with Systemic Insecticides.

Seed and row treatments with certain systemic insecticides indicated a marked variance in effectiveness of onion maggot control. Thimet and American Cyanamid 12008 compared favorably with aldrin and other chlorinated compounds.

16. NORRIS, DALE M., JR., Failure of Soil Insecticides to Control the Southern Potato Wireworm, *Conoderus falli* Lane.

Under field plot conditions, the control of wireworm injury to potato tubers by aldrin, heptachlor, chlordane, and dieldrin was studied. In general, control was unsatisfactory; only aldrin, 4 lbs./A.; and dieldrin, 5 lbs./A., gave differences significant from the untreated check at the .05 level. Through repeated exposure to the above soil insecticides, a high degree of resistance to these chemicals has apparently developed in *Conoderus falli* populations in potato fields of northern Florida.

17. NEEL, WILLIAM W., Nantucket Tip Moth Control Studies on Loblolly Pine.

Field plots of young loblolly pine were sprayed during 1956 and 1957 to determine the frequency of application and the effectiveness of DDT, malathion, and Guthion when applied for the control of the Nantucket tip moth.

To reduce the infestation significantly the insecticide has to be applied at least 3 times to coincide with the peak moth emergence during the first part of March, the latter part of May, and the middle of July.

Two-year-old field-planted pines sprayed 3 times with a 0.5% water emulsion of DDT grew, on the average, 16.7% more than the control trees. Similar growth comparisons during the 1957 season will be reported.

18. NAGEL, R. H., Control of the European Elm Scale with Systemic Insecticides.

Results from field trials for two years indicate that the scale may be controlled with several systemic insecticides. The chemicals were more effective when introduced into holes drilled into the sapwood than when applied as a soil drench around the root-collar.

19. JAYNES, H. A., Some Recent Developments in White-Pine Weevil Research in the Northeast.

Spring emergence of white-pine weevil, the most serious insect pest of eastern white pine, can now be predicted by using cumulative degree hours above 40°F. Dispersion of weevils in a small plantation has been recorded by tagging with a radioisotope. Fall insemination of weevils has been proved to be quite frequent and effective. Excellent control has been obtained with the knapsack sprayer using lindane, heptachlor, endrin, malathion, and DDT in the spring. Late fall applications of lindane has also given excellent results. Granulated insecticides, aldrin and heptachlor, have shown promise for the control of hibernating weevils.

20. NEISWANDER, R. B., The Occurrence, Distribution, and Control of Bagworms in Ohio.

Bagworm injury in Ohio is usually limited to the central and southern parts of the state, but it has occurred in northern Ohio in recent years. Damag-

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ing populations seem to occur in cycles. Tests carried on during a 3-year period indicate that the insect can be controlled effectively with dieldrin or malathion.

21. WILLIAMS, ROBERT E., Investigations on Control of the Bronze Birch Borer and the Flatheaded Apple Tree Borer.

Two different approaches have been attempted in the control of these two beetles. On the one hand, several of the relatively unstable but highly volatile organic phosphates have been used in an attempt to kill the larvae already in the tree by fumigation. On the other hand, DDT has been used in various concentrations and formulations in an effort to prevent the initial and subsequent infestations. At present, DDT is the most promising of the control measures.

22. GIESE, R. L., A. AZAWI, D. M. BENJAMIN, and J. E. CASIDA, Preliminary Studies on the Use of Systemic Insecticides in Conifers and Elm.

Four systemic insecticides were tested for efficiency following trunk implantation in controlling the larvae of the balsam gall midge, *Itonida balsamicola*, and the red-headed pine sawfly, *Neodiprion lecontei*, and the adult of the smaller European elm bark beetle, *Scolytus multistriatus*. Dimefox proved to be too phytotoxic for practical use. Demeton gave control of the sawfly larvae and demeton, Thimet, Chipman R6199 and dimefox controlled the gall midge larvae. The most promising systemic tested for control of the transmitter of the Dutch elm disease was p-toluene sulfonate salt related to R6199.

23. SCHULZ, JOHN T., and EDWIN T. HIBBS, The Toxicity of Certain Organic Phosphate Acaricides as Systemics in Chrysanthemum.

Incipient infestations of the two-spotted mite, *Tetranychus telarius*, in greenhouse ranges are a persistent menace to chrysanthemum production. Organic acaricides, including systemics and non-systemics, applied to the foliage had limited usefulness in control. Demeton and Thimet applied to the soil supplied toxicants which were systemic in vegetative parts of potted chrysanthemum and which were lethal to the mites at or above 20 p.p.m. of demeton and metabolites, or in the case of Thimet, at 200 p.p.m., as indicated by mortality of mites on plant tissue in situ along with electrometric measurement of cholinesterase inhibition exhibited by the compounds and their metabolites in the plant tissues. Neither compound nor their metabolites attained a concentration in the flower lethal to mites. Soil applications of granulated or emulsifiable dilutions offer promise of enduring control of mites if phytotoxicity can be overcome.

24. FERGUSON, WILLIAM C., Tedion, an Outstanding New Acaricide.

Tedion, 2,4,4,5-tetrachlorodiphenylsulfone, is a very promising new acaricide. Results of field tests have shown Tedion to be effective as a larvicide-ovicide in the control of mite species on citrus, deciduous fruits and ornamentals. Tedion promises to be a very important pesticide since it combines long-lasting residual control with safety to mammals and plant safety.

25. DICKINSON, BERTON C., Niagara 1240, a Promising New Acaricide and Insecticide.

Niagara 1240, identified chemically as bis(S-[diethoxyphosphinothioyl]mercapto) methane, has been tested rather extensively for the past two years

against a variety of mite and insect species of economic importance. It has been effective against the tetranychid mites particularly the European red mite and two-spotted spider mite. It has been sufficiently promising against codling moth, apple maggot and certain species of aphids to warrant additional study.

26. TIPPINS, H. H., The Effect of Different Rates and Application Dates of Granulated Insecticides in Clover Weevil Control.

An experiment involving the application of granulated dieldrin and heptachlor at several rates and on two dates for the control of *Hypera meleis* and *H. nigrirostris* was conducted at three locations in Georgia in 1957. Dieldrin at rates of 1 and 2 pounds and heptachlor at $\frac{1}{2}$, 1, and 2 pounds gave good control of the insects, resulting in increased yields of crimson clover seed. There were no differences in yield due to the date of application.

27. TUFT, T. O., and R. W. FOGLEMAN, Residue Studies and the Research Entomologist.

A discussion is made of the points in favor of making residue studies which are independent from the usual performance test. Such residue evaluation programs are discussed from a practical and commercial point of view. The field entomologist is apparently looked to as a source of the residue information necessary for product development. A designed program can materially assist early registration and aid in the general development of the compound.

28. HANSEN, H. L., and C. K. DORSEY, Granular Insecticides for Control of Alfalfa Weevil Larvae.

The results of field experiments using granular insecticide formulations for the control of *Hypera postica* larvae are reported. Granular heptachlor and dieldrin produced the best population reductions. Chlordane and endrin were less effective. Timing of applications of granular insecticides for alfalfa weevil control is discussed.

29. LINDQUIST, D. A., M. L. FAIRCHILD, T. A. BRINDLEY, and P. A. DAHM, Thiodan Residues on Corn.

Thiodan was applied to field corn as a water emulsion and as a 5% granulated formulation at the rates of 1.5 and 1.0 pounds per acre, respectively. The time and types of application were identical to those used for European corn borer control. Samples for residue analyses were taken at intervals over a 60-day period. The samples were chopped and a portion extracted with a mixture of Skellysolve B and diethyl ether. Comparative residue analyses were made using a total organic chlorine method and a more specific colorimetric method. The efficiency of extracting Thiodan residues from fresh, frozen, and thawed samples of corn plants was also studied.

30. SCHMIDT, CLAUDE, MALCOLM BOWMAN, and FRED ACREE, JR., Determination of N,N-Diethyltoluamide by Ultraviolet Spectrophotometry.

An ultraviolet spectrophotometric method for the determination of the insect repellent N,N-diethyltoluamide was developed. Quantities as low as 1 microgram of the material can be detected. Absorption spectra of the three isomers and a standard curve are presented.

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31. LILLY, J. H., L. MADAMBA, K. V. FREY, and P. A. DAHM, Thimet Residues in Small Grains Grown in Treated Soil.

Thimet-fertilizer mixtures were applied to small plots of which oats, wheat, and barley were grown in 1957. The development of anticholinesterase compounds was followed in the plants during the growing season and determined in the grain after harvest.

32. MARKARIAN, HAIG, FRANCIS J. KANE, and BEN H. KANTACK, Analysis of Foods for DDT and Lindane After Exposure to Insecticidal Fogs.

Macaroni, cocoa, flour, dry cereal, rice, coffee, beans, and sugar packaged in various representative materials, were stored under simulated warehouse conditions and exposed at 28-day intervals to an insecticidal fog containing 10% DDT and 5% lindane. Analyses of the food for DDT and lindane were made after 1, 3, and 9 exposures. Results to date indicate that some of the foods absorbed DDT and lindane under these conditions of exposure.

33. PFAEFFLE, W. O., J. GURLAND, P. A. DAHM, and I. LEE, Bioassay-Technique for Analyzing Guthion Residues in Alfalfa.

A bioassay technique has been developed for the determination of Guthion residues in alfalfa. A known amount of purified Guthion was added to the sample extracts in order to make all the samples of about equal potency. Control extract was added to the standard as well as to the test doses to have all the doses contain the same volume of extract assuring the same masking effect for all points. In this way it was possible to use the same standard curve for several samples without disturbing parallelism and linearity. Six point assays were used. Logit x^2 and Normit x^2 methods of statistical analysis were used for estimating the relative potency by means of 95% confidence intervals.

34. FAHEY, JACK E., J. G. RODRIGUEZ, HAROLD W. RUSK, and C. E. CHAPLIN, Pesticide Residues on Strawberries.

The results of studies of the loss of pesticide residues on strawberries are presented. The magnitude of residues found on strawberries one day after spray applications is low. The berry caps often contain as much or more residue than capped berries. Observations on the control of the two-spotted spider mite with several acaricides are also reported.

35. GETZIN, L. W., and R. K. CHAPMAN, The Fate of Some Systemic Insecticides in Soils with Special Reference to Thimet.

With systemic insecticides such as schradan, demeton, Isolan, Phosdrin, and Thimet, the insect control varies from extremely poor to excellent as the soil type to which the material is applied varies from light sand to heavy clay loam or muck. In an effort to determine why these insecticides vary so markedly in their efficiency when used in various soil types it has been found that: (1) organic matter content in the soil is the main factor in binding the insecticides, (2) particle size down to that of silt is not important in insecticide binding, (3) no appreciable hydrolysis of Thimet occurs in any soil but oxidation of the insecticide takes place with equal ease in all soils but not in quartz sand, (4) pH changes from 5 to 8 have no effect on the hydrolysis or persistence of Thimet in soils, (5) when sprayed on soil surfaces, after an initial loss of about 20% in the first hour, little further loss of Thimet occurs in a month.

36. LICHENSTEIN, E. P., The Movement of Some Insecticides in Soils.

Lindane, Thimet and parathion were incorporated into a sandy soil, Miami Silt Loam and muck soil. The movement of these insecticides vertically and horizontally has been investigated under leaching and non-leaching conditions. Colorimetric and radioactive methods have been employed.

37. LICHENSTEIN, E. P., and J. T. MEDLER, Disappearance of Aldrin and Heptachlor Residues on Alfalfa.

Alfalfa was treated with heptachlor ($\frac{1}{4}$ lb./acre and $\frac{1}{2}$ lb./acre) and aldrin ($\frac{1}{4}$ lb./acre and $\frac{1}{2}$ lb./acre) in 1956. Samples cut with a forage chopper were taken initially after spraying and 1 day, 3 days, 7 days, 14 days and 21 days afterwards. Samples were analyzed by chemical and bioassay methods. Data on residues found are presented and discussed.

38. GANNON, NORMAN, and G. C. DECKER, The Conversion of Heptachlor to Its Epoxide on Plants.

Recent studies indicate that heptachlor converts to heptachlor epoxide on certain plants and may occur on plants in general, as is the case in the animal body. A one pound per acre treatment of heptachlor on alfalfa while dissipating to less than 0.1 p.p.m. of heptachlor in 13 days, yielded residues of heptachlor epoxide which had not dropped to this level until 25 days after spraying. This is of considerable importance since the epoxide is reportedly of greater insect and mammalian toxicity than is the parent material. This conversion has also been proved on corn and soybeans.

Specific colorimetric data are substantiated by bioassay, total organic chloride, paper chromatographic, and infrared spectroscopic methods.

39. GANNON, NORMAN, and G. C. DECKER, The Conversion of Aldrin to Dieldrin on Plants.

Aldrin converts to dieldrin on certain plants, just as it does in the animal body. The magnitude of the dieldrin produced is sufficient to warrant consideration. As a result of treating alfalfa with aldrin at a dosage of 1 pound per acre, aldrin residues were below 0.1 p.p.m. after 8 days while residues of the dieldrin produced had not dissipated to this level until 25 days after spraying. The conversion also occurs on corn and soybeans and may take place on plants generally.

This conversion has been substantiated by data provided by specific colorimetric, bioassay, total organic chloride, paper chromatographic, and infrared spectroscopic methods.

40. STERN, VERNON M., and ROBERT VAN DEN BOSCH, The Integration of Chemical and Biological Control of the Spotted Alfalfa Aphid in California.

Demeton, parathion, malathion, Trithion, and Phosdrin all give satisfactory control of susceptible populations of the spotted alfalfa aphid. Demeton applied at 1 to 2 ounces per acre is the superior insecticide for spotted alfalfa aphid control because it is relatively non-toxic to predators. Demeton is also appreciably less toxic to adults of the newly introduced aphid parasites. All five materials give mediocre control of resistant aphid populations. However, when substantial predator populations are present, the more selective demeton allows the natural enemies to survive treatment and they destroy the remaining resistant aphids.

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41. HENNEBERRY, THOMAS J., NEIL W. STUART, and FLOYD F. SMITH, The Effect of Different Levels of Plant Nutrition on Susceptibility of the Two-Spotted Spider Mite (*Tetranychus telarius* L.) to Malathion.

Colonies of the two-spotted spider mite (*Tetranychus telarius*) have been reared on plants subsisting on high and low levels of nitrogen, potassium and phosphorous. The effect of these levels of plant nutrition on the susceptibility of the mites to malathion will be discussed.

42. BRANES, DOUGLAS, Insect Problems in Association with Corn Storage in Mexican Tropics.

Severe insect infestations are one of the factors limiting corn storage in tropical Mexico. The methods of storage, developed by trial and error over generations for the safeguarding of corn, will have to change as farming becomes more intensified and grain production increases. Present storage methods, levels of insect infestations in the ear in the field at harvest and changes in the condition of corn during storage will be briefly discussed.

The protection of grain from insect attack by the use of insecticides will be only one of the techniques which will have to be employed to assure safe storage.

The residual effects of nine insecticides used as protectants applied at different rates to corn stored in humid tropical conditions will be compared with those obtained from a similar test being conducted in the dry cool conditions of Mexico City.

43. STRONG, R. G., and L. D. LINGREN, Effect of Atmospheric Fumigation with Methyl Bromide on the Germination of Grain Seeds.

Methyl bromide fumigation in the Khapra beetle eradication program lends emphasis to a complete study on the effect of this fumigant on the germination of seeds. Factors considered in a series of experiments include moisture content of seeds, dosage of fumigant, temperature during fumigation, length of exposure to fumigant, time after fumigation, repeated fumigation, and varietal differences within a species. Results from germination tests with wheat, oats, and barley are reported.

44. WHITNEY, W. KEITH, Effects of Methyl Bromide Fumigation on the Viability of Barley, Corn, Milo, Oats, and Wheat Seeds.

Viability of seeds may be seriously impaired by overexposure to methyl bromide. Susceptibility of seeds to injury is dependent upon combinations of several variable factors such as moisture content, kind of seed, temperature, length of exposure and dosage applied.

Tests were conducted to determine the effects of methyl bromide on the viability of barley, corn, milo, oats, and wheat when fumigated at 80°F. with different dosages, exposures and moisture contents. In some experiments standard seedling evaluations were made so that sub-lethal injurious effects could be observed. Many fumigated seeds did not develop normally. In general, the results of the study showed that little injury occurred when the seed moisture was below 12 percent, the dosage was less than two pounds per 1,000 cubic feet, and the exposure period was less than 24 hours at 80°F. High temperature, moisture, dosage and long exposure all contribute to seed injury. Barley and oats demonstrated greater tolerance to methyl bromide than corn, milo or wheat.

45. SCHESSER, JOHN H., and W. E. PRIDDLE, Insecticidal Residues in Milling Fractions From Wheat Treated with Methoxychlor, Malathion, and Lindane.

Previous research has indicated that organic insecticides migrate to various parts of the wheat kernel. This study has been initiated to substantiate the previous results. This test was made with three insecticides—lindane, malathion, and methoxychlor. Liquid and dust treatments were applied at various dosages. In most cases, both aged and fresh treatments were used in the testing program. The results of insecticidal residue analyses of milling fractions indicate that very small amounts of the applied insecticide were carried through into the flour. The insecticides were present in the largest amounts in the bran coat and were recovered in the bran. Malathion was recovered in the smallest amounts with 0 p.p.m. to 0.3 p.p.m. present in the flour. Methoxychlor treatments had a recovery of up to 1.8 p.p.m. in the flour while lindane recovery was as high as 2.6 p.p.m. in flour.

46. RUPPEL, ROBERT F., Chemical Control Studies of Pests of Stored Beans and Corn in Colombia.

The rice weevil, Angoumois grain moth, bean weevil, and the "spotted bean weevil" *Zabrotes subfasciatus*, cause severe damage to beans and corn that are stored in Colombia. Sprays of lindane, malathion, methoxychlor, or the mixture of piperonyl butoxide with pyrethrins have proved effective for bin sanitation. Fumigation has been unsatisfactory due to inadequate facilities on the farms. Protective dusts of lindane at 5 p.p.m., malathion at 8 p.p.m., and the mixture of piperonyl butoxide at 17 p.p.m. and pyrethrins at 1 p.p.m. have shown promise in experiments and are presently being tested for commercial use. Dusts of methoxychlor at dosages up to 10 p.p.m. have been unsatisfactory particularly against the rice weevil. The success of any chemical control method depends on the correction of the poor grain management practices that are now employed.

47. APPLE, J. W., F. E. STRONG, and E. M. RAFFENBERGER, Protecting Corn and Lima Bean Seed from Wireworm Attack with Insecticidal Seed Treatments.

Dieldrin, heptachlor, aldrin, and lindane were compared as seed treatments on corn in soil infested with various species of wireworms. Dosages ranged from 0.1 to 1.0 ounce of insecticide per bushel of seed. Wettable powder and solubilized insecticide formulations were used in slurries with a standard fungicide. Within these tests, certain plots were given a broadcast treatment of heptachlor to provide a "maximum control" index. The previously mentioned insecticides plus chlordane, parathion, EPN, endrin, and isodrin were evaluated as seed protectants on lima beans. This test showed 47 per cent kill of wireworms located in the rows having an insecticidal seed treatment.

48. REYNOLDS, H. T., and L. D. ANDERSON, Cultural and Chemical Control of the Lesser Cornstalk Borer in Southern California.

A properly timed irrigation has given adequate control of this pest when susceptible crops are flat-planted for flood irrigation or when planted in the bottom of the irrigation furrow. When planted on beds, a pre-emergence application of granulated materials or a well-timed application of granulated or

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spray materials applied just after plant emergence gave control. Aldrin, heptachlor, dieldrin, and endrin were the most effective materials tested.

49. BENDER, GORDON L., and GRANT L. RICHARDSON, Spray and Dust Experiments on the Control of the Lesser Cornstalk Borer on Sorghum.

Sprays or dusts were applied to the soil in a band treatment above the seed immediately following planting and to the young plants upon emergence. Criterion of success of treatment was the percentage of undamaged plants. Materials in the order of their decreasing effectiveness were: dusts—R-1303, endrin, dieldrin, chlordane, malathion; sprays—endrin, lindane, dieldrin, heptachlor, aldrin, toxaphene, chlordane. Results of two years' experiments are presented.

50. GERHARDT, PAUL D., Evaluation of Granulated Insecticides for Lesser Cornstalk Borer Control.

The lesser cornstalk borer, *Elasmopalpus lignosellus* has caused increased damage to seedlings of late planted sorghum in the Salt River Valley of Arizona.

Results of 1956 tests indicated that granulated insecticides applied at planting time offered some protection.

Granulated formulations of the following insecticides were applied during June and July, 1957: 2½% heptachlor, 5% chlordane, 2% dieldrin, 2% aldrin, 2% endrin, 5% Sevin, 2½% Di-Syston, 8% Thimet and 8% Compound 12008. These were applied at rates of ¼, ½, and 1 pound per acre at seeding time.

Of the chlorinated hydrocarbons, heptachlor, aldrin, and endrin were more effective at all dosages. The systemics, Thimet, Di-Syston, and Compound 12008 were less effective but did not cause phytotoxicity.

51. HARRISON, FLOYD P., A Study of the Ecological Factors Influencing the Time of Application of Chemical Treatments for Corn Earworm.

During the growing seasons of 1954 and 1956, observations were made in an attempt to correlate plant development and earworm infestation. Results of these observations led to the contrivance of a mathematical system which indicated the optimum timing that would have been effective in the plantings observed. These calculations were used in timing several treatments to sweet corn in 1956 and 1957. Results of these experiments indicate that treatments applied according to the mathematical calculations from the 1954-1956 observations were applied at optimum time.

52. WALL, HOWARD CLEM, and WILLARD H. WHITCOMB, Insecticide Tests Against the Southwestern Corn Borer *Zeadiatraea grandiosella* Dyar During 1957 in Arkansas.

Endrin gave best insecticide control of southwestern corn borer in tests in the Arkansas River Valley during 1957. All trials were made against natural infestations. Control was directed against second and third generations. Heptachlor, malathion, Guthion, and Thimet were the principal other toxicants tested. Effectiveness of granules, spray, and dust were compared.

53. HARDING, J. A., and M. L. FAIRCHILD, Bulk Density of Granulated Carriers in Relation to European Corn Borer Control.

Experiments were conducted at the Ankeny European Corn Borer Research Laboratory, operated cooperatively by the Iowa Agricultural Experiment Station and U. S. Department of Agriculture, in 1956 and 1957, to investigate the hypothesis that the number of particles of a granulated carrier per unit area, if having the same amount of toxicant applied to that area, will influence the toxicant's capacity for controlling the European corn borer. The data collected from eleven different experiments indicated a trend toward comparable control with either smaller poundages having more particles per acre or larger poundages with fewer particles per acre. Low poundages having many particles per acre tended to give poorer control than intermediate or high poundages.

54. KIRK, VERNON M., Pre-Planting Treatment for Billbug Control on Corn.

A 2-year program was conducted to corroborate previously reported data which indicated a broadcast, disked-in, pre-planting application of aldrin resulted in excellent control of billbugs on corn.

In 1956 damage following treatment ranged from 3.6% to 40.3%. Subsequent insectary data showed that the more organic soils required higher rates of insecticide to give control equivalent to 2 pounds aldrin on more mineral soils. In 1957 two pounds aldrin per acre on mineral soils and 4 pounds on organic soils resulted in reduction of damage from 1% to 1/10%, while untreated fields averaged 56.5% loss of stand.

55. LONG, W. H., E. J. CONCINNE, and L. D. NEWSOM, Sugarcane Borer Control with Ryania, Toxaphene and Endrin.

Results from two years of work with airplane application of insecticides are presented. Endrin and toxaphene in dust and granulated formulations are compared with the presently recommended and widely used 40 per cent ryania dust and with an experimental 100 per cent ryania dust. Weekly and bi-weekly intervals between insecticide applications were tried. Results from residue analyses are presented.

56. ROUSE, ERNEST PHILIP, and WILLARD H. WHITCOMB, The Grape Colaspis as a Pest of Rice in Arkansas.

Rice following lespedeza in Arkansas sometimes suffers stand reduction due to the activities of the grape colaspis, *Colaspis flavidus*. A study was made of the effect of this stand reduction on actual yield. Control was obtained with aldrin granules applied to the soil at the rate of two pounds of actual material per acre. Control was also obtained by seed treatment with Thimet.

57. BOWLING, C. C., Seed Treatment for Control of the Rice Water Weevil.

Four experiments were conducted at the Rice-Pasture Experiment Station, Beaumont, Texas in 1956 to determine if seed treated with insecticides before planting would control the rice water weevil, *Lissorhoptrus oryophilus*. Seven insecticides were used at the rate of 8 ounces of toxicant per 80 pounds of seed in two greenhouse tests. Three insecticides, lindane, aldrin, and dieldrin gave 90% or better control in both tests. Thimet gave 50% or better control in both tests. These four materials were used

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at 2, 4, and 8 ounces of toxicant per 100 pounds of seed in a small plot test. In this test aldrin, dieldrin and lindane gave about 90% control at 8 and 4 ounces of toxicant per 100 pounds seed. Although good control of larvae was obtained, no significant increases in yield were obtained. Dieldrin at approximately 1 ounce of toxicant per 100 pounds seed gave good control of a light infestation in a large field test.

58. ROUSSEL, JOHN S., Cotton Insect Control and Cotton Yields.

Increased fertilization, irrigation and indeterminate varieties of cotton result in a long growing season and potentially more severe damage from cotton insect pests. The effects of present practices and those used previously on yield reduction due to insects are compared.

Insect control programs, effectively used at present, have yielded great returns per dollar spent. As an example of this return, it was estimated that efficient control of cotton pests during 1956 resulted in a saving of \$27 million to the cotton producers of Louisiana.

59. MERKL, M. E., T. R. PFRIMMER, R. E. FURR, and E. P. LLOYD, Susceptibility of Cotton Varieties to Thimet Seed Treatment and Insects at Stoneville, Mississippi.

Eight commercial varieties of cotton which are grown extensively in the Mississippi delta were compared for the effect on Thimet on stand and their susceptibility to thrips attack.

The Dixie King variety was seriously affected by the Thimet treatment, DPL-Fox, Coker 124, DES-7343, Delfos 9169, DPL-15, Stoneville 3202 and Stoneville 7 were somewhat less affected. There was no significant difference in numbers of thrips per plant or in thrips damage ratings of the various varieties.

Several experimental varieties of cotton were compared in other tests to determine differences in susceptibility to thrips and aphids. There were statistical differences between some varieties with respect to numbers of thrips per plant and number of aphids per square inch of leaf surface. The pilosity of the plants was the major factor involved in the number of insects per plant.

60. LLOYD, E. P., R. E. FURR, and M. E. MERKL, Seasonal Variation in Susceptibility of Boll Weevils to Insecticides.

Results of topical application tests in the fall of 1956 and the spring of 1957 indicated seasonal differences in susceptibility of the boll weevil to insecticides. LD-50 values obtained with aldrin, BHC, endrin, toxaphene, heptachlor, Thiodan, malathion, methyl parathion, Guthion and Phosdrin for weevils from the hill and delta sections of Mississippi will be presented.

61. PFRIMMER, T. R., E. P. LLOYD, and M. E. MERKL, Field Tests with New Insecticides Against Cotton Insects at Stoneville, Mississippi.

Several new insecticides and insecticide combinations were tested in small-plot field experiments against cotton insects during 1957. These materials included Sevin, Korlan, Monsanto CP-7769, Thiodan,

Phosdrin and Hercules 3895. Results with these materials against the boll weevil, bollworms, aphids and spider mites are given in this paper.

62. PFRIMMER, T. R., and M. E. MERKL, Dosage-Interval Tests with Phosphate Insecticides Against Cotton Insects at Stoneville, Mississippi.

During the cotton-growing season of 1957 three small plot field tests were conducted against cotton insects. Various dosages (lb./A) of Guthion (0.25-0.75), methyl parathion (0.25-0.50), and malathion (0.5-2.0) were compared at different intervals of treatment ranging from 3-10 days. DDT was included with all treatments for bollworm control. Results against the boll weevil, bollworm, aphids, and spider mites are given in this paper.

63. FURR, R. E., and E. P. LLOYD, Preliminary Field Cage Studies on the Residual Toxicity of Methyl Parathion, Guthion and Malathion to Adult Boll Weevils.

Guthion 0.25 lb./A., methyl parathion 0.25 lb./A., and malathion 0.5 lb./A. were applied as emulsions to field plots at the rate of 3.7 gallons of spray per acre. Fifty adult boll weevils were confined to each treated plot immediately after treatment and at 2 hour intervals thereafter for 12 hours. Mortality counts were made each hour for 10 hours. Guthion gave highly effective kill in 24 hours even when caged 12 hours after treatment. Methyl parathion was not effective (less than 75% kill) 4 hours after treatment. Malathion was not effective 8 hours after treatment.

In a second experiment, Guthion 0.5 lb./A., methyl parathion 0.5 lb./A. and malathion 2.0 lb./A. were used. Guthion was highly effective in this experiment. Methyl parathion was effective for 6 hours and malathion was effective for 24 hours even when caged 24 hours after treatment.

64. REED, JOHN K., and C. H. ARNDT, Evaluation of Thimet as a Seed Treatment for Cotton.

Thimet, impregnated on carbon, was used to treat cotton seeds. Laboratory and field experiments were conducted to test the effect of this treatment on the subsequent germination of the seed and post-emergence growth of the cotton plants. Data are given to show that this treatment delayed the time of fruiting, but not the number of fruits per plant. Good thrips control and partial control of flea beetles were obtained on the seedling cotton. Final yields of seed cotton were not greatly affected by seed treatment.

65. CLOWER, DAN F., Control of the Three-Cornered Alfalfa Hopper, *Spissistilus festinus* (Say) in Alfalfa in Louisiana.

The three-cornered alfalfa hopper, *Spissistilus festinus* (Say) is considered to be one of the most important insect pests of alfalfa in Louisiana. Previous attempts to control this insect have been ineffective or have produced erratic results.

Tests conducted during 1956 and 1957 showed malathion and phosdrin to be effective against *Spissistilus festinus*. The rates per acre required to give effective control have been established experimentally. The relationship of insecticidal control to the length of time between cutting dates is discussed. Tests were conducted on alfalfa being grown for hay, for mechanical dehydration, and for seed.

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 Wingo, Curtis W., D 17
 Woke, Paul A., D 40
 Wolfenbarger, D. O., F 14
 Wolfenbarger, Dan, F 13
 Woodruff, Robert E., D 34
 Wylie, W. D., F 2
- Young, Frank N., D 16
 Young, William R., Cd 22

NOTES

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SUSTAINING ASSOCIATES ENTOMOLOGICAL SOCIETY OF AMERICA

The firms and institutions listed here are proudly acknowledged as Sustaining Associates of this Society. We commend these Associates to the attention of our members.

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|--|---|---|
| <p>American Cyanamid Company
Phosphates & Nitrogen Division
Insecticide Department
30 Rockefeller Plaza
New York 3, New York. 1956-57</p> | <p>G. L. F. Soil Building Service
Div. of Coop. G. L. F. Exchange,
Inc.
Ithaca, New York. 1955-56-57</p> | <p>Port Fertilizer & Chemical Co.
P.O. Box 337
Los Fresnos, Texas. 1955-56-57</p> |
| <p>Birds Eye Division
General Foods Corporation
250 North Street
White Plains, New York.
1955-56-57</p> | <p>The Gardening Council
Newark, New York. 1956-57</p> | <p>R. J. Reynolds Tobacco Company
Winston-Salem, North Carolina.
1956-57</p> |
| <p>California Spray-Chemical Corp.
Lucas & Ortho Way
Richmond, California. 1956-57</p> | <p>General Chemical Division
Allied Chemical & Dye Corpora-
tion
40 Rector Street
New York 6, New York.
1955-56-57</p> | <p>Rohm & Haas Company
222 W. Washington Square
Philadelphia 5, Pennsylvania.
1955-56-57</p> |
| <p>A. L. Castle, Inc.
P.O. Box 308
Mountain View, California. 1957</p> | <p>Gulf Oil Corporation
Gulf Building
Pittsburgh 30, Pennsylvania.
1955-56-57</p> | <p>Shell Chemical Corporation
Agricultural Chemical Sales
Division
460 Park Avenue
New York 22, New York.
1955-56-57</p> |
| <p>Chemagro Corporation
437 Fifth Avenue
New York 16, New York.
1955-56-57</p> | <p>Hercules Powder Company
Agricultural Chemicals Division
Naval Stores Department
Wilmington 99, Delaware.
1955-56-57</p> | <p>Stauffer Chemical Company
380 Madison Avenue
New York 17, New York.
1955-56-57</p> |
| <p>Colloidal Products Corporation
100 Gate Five Road
Sausalito, California. 1956-57</p> | <p>Jackson & Perkins Company
Newark, New York. 1955-56-57</p> | <p>Thompson-Hayward Chemical Co.
2915 Southwest Boulevard
Kansas City 8, Missouri. 1956-57</p> |
| <p>The Dow Chemical Company
Agricultural Chemicals Division
American Legion Building
Midland, Michigan. 1956-57</p> | <p>Minerals & Chemicals Corp. of
America
Menlo Park, New Jersey.
1956-57</p> | <p>The Triangle Company
320 W. Market Street
Salinas, California. 1956-57</p> |
| <p>E. I. duPont de Nemours Co., Inc.
Grasselli Chemicals Department
Wilmington 98, Delaware.
1955-56-57</p> | <p>Monsanto Chemical Company
800 N. 12th Boulevard
St. Louis 1, Missouri. 1956-57</p> | <p>Union Carbide Chemicals Company
30 East 42nd Street
New York 17, New York.
1955-56-57</p> |
| <p>Eastern States Farmers' Exchange,
Inc.
26 Central Street
West Springfield, Massachusetts.
1956-57</p> | <p>Niagara Chemical Division
Food Machinery & Chemical Cor-
poration
100 Niagara Street
Middleport, New York.
1955-56-57</p> | <p>United Fruit Company
Research Department
80 Federal Street
Boston 10, Massachusetts.
1955-56-57</p> |
| <p>Fairfield Chemical Division
Food Machinery and Chemical
Corporation
441 Lexington Avenue
New York 17, New York.
1956-57</p> | <p>S. B. Penick & Company
50 Church Street
New York 8, New York.
1955-56-57</p> | <p>Velsicol Chemical Corporation
330 East Grand Avenue
Chicago 11, Illinois. 1955-56-57</p> |
| <p>Freeport Sulphur Company
P.O. Box 1520
New Orleans 5, Louisiana. 1957</p> | <p>Pennsylvania Farm Bureau
Cooperative Association
3609 Derry Street
Harrisburg, Pennsylvania.
1955-56-57</p> | <p>Wilson Products Division
Ray-O-Vac Company
Reading, Pennsylvania. 1956-57</p> |
| | | <p>Woolfolk Chemical Works, Ltd.
E. Main Street
Fort Valley, Georgia. 1956-57</p> |

(Continued from page 6)

MEETINGS

LOUISVILLE, KENTUCKY. Brown Hotel. October 21-24, 1957. The 1957 Annual Convention of the National Pest Control Association. Ralph E. Heal, Executive Secretary, Buettner Memorial Building, 250 West Jersey Street, Elizabeth, New Jersey.

LETHBRIDGE, ALBERTA, CANADA. Marquis Hotel. October 29-31, 1957. The Seventh Annual Meeting of the Entomological Society of Canada and the Fifth Annual Meeting of the Entomological Society of Alberta. D. S. Smith, Secretary, Science Service Laboratory, Crop Insect Section, Box 270, Lethbridge, Alberta, Canada.

NEW YORK, NEW YORK. Commodore Hotel. November 25-26, 1957. The Twenty-Ninth Annual Meeting, Eastern Branch, Entomological Society of America. B. F. Driggers, Secretary-Treasurer, New Jersey Agricultural Experiment Station, New Brunswick, New Jersey.

BANGKOK, THAILAND. Chulalongkorn University, November 18—December 9, 1957. Ninth Pacific Science Congress of the Pacific Science Association, Office of the Secretary-General of the Congress, Department of Science, Ministry of Industry, Bangkok, Thailand.

MEMPHIS, TENNESSEE. Hotel Peabody. December 2-5, 1957. The Fifth Annual Meeting of the Entomological Society of America. H. M. Armitage, President, 1617 41st Street, Sacramento 19, California. H. G. Johnston, Chairman, Local Arrangements Committee, National Cotton Council, Memphis, Tennessee. E. N. Woodbury, Chairman, Program Committee, Hercules Powder Company, Research Center, Wilmington, Delaware. R. H. Nelson, Executive Secretary, 1530 P Street, N.W., Washington 5, D. C.

MEMPHIS, TENNESSEE. Hotel Peabody. December 2-5, 1957. The Thirty-Second Annual Meeting, Cotton States Branch, Entomological Society of America. In conjunction with the parent Society (See above). M. E. Merkl, Secretary-Treasurer, Box 202, Leland, Mississippi.

HOLLYWOOD, FLORIDA. Hollywood Beach Hotel, December 9-12, 1957. The Forty-Fourth Annual Meeting of the Chemical Specialties Manufacturers Association, Inc. H. W. Hamilton, Secretary, C.S.M.A., 50 East 41st Street, New York 17, New York.

INDIANAPOLIS, INDIANA. December 26-31, 1957. The One-Hundred Twenty-Fourth Meeting of the American Association for the Advancement of Science. Dael Wolfe, Executive Officer, AAAS, 1515 Massachusetts Avenue, N.W., Washington 5, D. C.

MAPS

The maps on the inside back cover may answer questions which come to our members and, in the case of the Meeting Regions map, help in making plans for the future. Complete information on Branches will be found in Article VII of the Constitution.

Meeting Regions are independent of Branch Areas and were set up in 1953 by a committee of which Dr. H. M. Harris was Chairman. Beginning with the Third Annual meeting in Cincinnati in 1953 the yearly meetings of the Society rotate clockwise within the four regions. The eighth annual meeting will be held in the east in 1960 and ninth in the south in 1961 and so on.

Our meetings start on the first Monday after Thanksgiving except about once in ten years when we meet with the AAAS.

NECROLOGY

BRIDEWELL, JOHN C. 79. Retired Coleopterist and Hymenopterist. At his home in Culpeper, Virginia, August 9, 1957.

CHAMPLAIN, ALFRED B. 74. Retired Entomologist, Pennsylvania Department of Agriculture. At Harrisburg, Pennsylvania, April 15, 1957.

KENNEDY, ROBERT D. 60. Plant Quarantine Inspector, U.S.D.A. In charge of the Philadelphia office since 1937. In Philadelphia, January 21, 1957.

NEEDHAM, J. G. 89. Retired Teacher of Entomology, Cornell University. HONORARY MEMBER, Entomological Society of America. At his home in Ithaca, New York, July 24, 1957.

NOON, WALTER C. 47. Commercial Entomologist of Nogales, Arizona. In an airplane accident at Puerto Libertad, Sonora, Mexico, February 8, 1957.

SKOW, AL. 57. Commercial Entomologist. At his home in Salinas, California, January 9, 1956.

TANNER, MATHIS C. 65. Retired Teacher and Plecoterist. At his home in Ogden, Utah, August 1, 1957.

THEN AND NOW

A few notes on the entomological meetings that were held in 1916 in New York City, between Christmas and New Years' may be of interest to our members. (These were the first meetings I ever attended.) As in 1956, these meetings were held in conjunction with those of the AAAS.

Headquarters were at the Endicott Hotel, 81st St. and Columbus Ave., where rates of \$1.50 per day had been secured! Most of the meetings were at Teachers' College, Columbia University; a few sessions were held at the American Museum of Natural History.

The ESA held its meetings December 26 and 27, and the AAEE began its regular sessions on Dec. 28. The only overlapping was on the morning of Dec. 27, when a joint meeting of the Section on Horticultural Inspection and the American Phytopathological Society conflicted with the meeting of the ESA. The other sessions of the Section on Horticultural Inspection and those of the Section on Apiary Inspection were held when no other entomological meetings were in progress.

At the beginning of the meetings the AAEE had a membership of 466. The ESA was ahead in this respect, with a total of 578. The combined expenditures by the two organizations for 1916 were less than \$4500.

How times have changed!

B. A. PORTER

ELECTION RESULTS

Harry S. Smith and S. W. Frost were elected to Honorary Membership in the Society.

E. Gorton Linsley and Morris Rockstein were elected to the Governing Board.

In a close race, Paul J. Chapman, Wm. M. Hoskins and Paul W. Oman were the three highest on the President-elect ballot. A run-off ballot has gone out to the membership.

ENTOMOLOGISTS AT 1956 AAAS MEETING

According to figures released in the April 1957 issue of *The Scientific Monthly*, Entomology should be proud of the fact that on the basis of subject fields represented, it led all others in registration at the 1956 Annual Meeting of the American Association for the Advancement of Science, in New York City, December 28-30, 1956, with a total of 599. This number represented 11.2 per cent of the total registration which was 5,327. Only one other subject field, Science Teaching and Education, came any where near this number, with 531. General Biology was third with 301.

It is equally interesting that in spite of the inopportune time of the year—between Christmas and New Year's, with the program extending through late Saturday night to Sunday noon, the registered number of entomologists was roughly 15 per cent of the total membership of the Society. This is unusually high for any annual meeting. Total attendance at the meetings, representing all sciences, was about 11 per cent of the membership of AAAS, which is quoted as 52,718.

However, in spite of this preponderance of entomologists, I was disturbed in being unable to find any listed among the officers and committee membership other than our two representatives to the Council, Dr. J. J. Davis and Dr. George H. Bradley. This may be due to the Society not working as closely with AAAS as it should.

H. M. ARMITAGE, *President*

1956 FUNGICIDE TESTS

Results of 1956 Fungicide Tests reprinted from a series of articles appearing in *Agricultural Chemicals*, February through August, 1957, may be purchased in bound and covered form for \$1.00 per copy by sending orders with remittance to Dr. A. B. Groves, Department of Plant Pathology, Virginia Agricultural Experiment Station, R.R. 3, Winchester, Va. The publication of these results is under the sponsorship of the American Phytopathological Society. It is a continuation of the publication of results formerly provided through a Supplement of the Plant Disease Reporter, Plant Disease Epidemics and Identification Section, U. S. Department of Agriculture.

The Temporary Advisory Committee on Collecting and Disseminating Data on New Fungicide Tests of the American Phytopathological Society arranged for the recent publication of data and the continuation of a program for annual publications of Fungicide Test Results in the future. Dr. A. B. Groves, Department of Plant Pathology, Virginia Agricultural Experiment Station, Winchester, Va., will be in charge of this project during the current year.

WHAT IS YOUR STATUS?

It is a well established fact that present day employment in entomology, as a profession, requires evidence of graduation from a recognized college or other institution of higher learning. Unfortunately, and all too often, the degree so earned rapidly loses its true value due to the failure of the graduate to continue his studies and keep pace with changing times. A glaring indicator of such a situation is non-membership in the organization representing the graduate's profession, and non-subscription to or purchase of the publications of that organization that would keep him informed on current developments in his profession.

H. M. ARMITAGE, *President*

WHAT IS AN ADEQUATE SALARY?

A discussion of salaries that took place among entomologists nearly 40 years ago may be of interest to present-day membership. In 1919 the Executive Committee of the American Association of Economic Entomologists worked with a special committee to study the problem of salaries. Some 260 entomologists returned questionnaires, reporting their current salaries and indicating the salaries that they would consider adequate. Those responding to the questionnaire were divided into three classes and their reports were summarized as follows:

Class III Entomologists (Men who were doing the work of assistants) were then receiving an average salary of \$1704 a year. The average minimum salary desired by these men was \$2419.

Class II consisted of men responsible for important and well defined sections of work, although not officially Heads of Departments. These men were then receiving an average salary of \$2070 and felt that an adequate minimum salary would be \$3024.

Class I consisted of men who were Heads of Departments or important divisions of large organizations. Their average salary at that time was \$3015 a year. No indication was given as to the salary that they would consider adequate.

Following the report of this committee the Association adopted resolutions endorsing the following as reasonable compensation for efficient professional services in entomology: (a) Chief Executive, \$7500, (b) Department or Division Head \$4000, (c) Associate or Senior Assistant \$3000, and (d) Assistant \$1800.

Even after adjustments have been made for the present decreased value of the dollar, it is evident that entomology, especially in the middle and lower bracket positions, has made progress salary-wise.

B. A. PORTER

INSECT CONTROL WEEK

Governor Marvin E. Griffin, of Georgia, proclaimed August 18 to 24 as "Insect Control Week," according to E. E. Heuermann, Atlanta district manager, Shell Chemical Corporation, who headed up the week for the Georgia Entomological Society.

The Governor's proclamation pointed out the great loss insects cause annually in Georgia and promoted measures which would reduce this loss. "With the population growing at the rate of 130,000 persons per day, a group of American experts in land conservation recently predicted that America might be feeling a pinch on its available food supply before 1970," Heuermann said. "If the challenge of population growth is to be met by the nation's farmers, it will be through mechanization and adoption of the latest scientific advances in mass food production. One of the more important of these advances is the practice of controlling insects through the use of agricultural chemicals."

To bring this point home to Georgia farmers, "Insect Control Week" dramatized the important contributions the agricultural chemicals industry is making.

BRANCH OFFICERS

See the inside back cover of the March 1957 and page 3 of the June 1957 BULLETIN for previous listings. At their forty-first annual meeting on June 26-28 the Pacific Branch elected the following officers:

Laurence S. Jones, *Chairman*, Riverside, California; Leslie M. Smith, *Chairman-Elect*, Davis, California; H. H. Keifer, *Secretary-Treasurer*, Sacramento, California.

ZOOLOGICAL NOMENCLATURE

Notice of proposed use of the Plenary Powers in certain cases for the avoidance of confusion and the validation of current nomenclatorial practice. (A.(n.s.)37)

Notice is hereby given that the possible use by the International Commission on Zoological Nomenclature of its Plenary Powers is involved in applications relating to the under-mentioned names included in Parts 6 and 7 of Volume 13 of the *Bulletin of Zoological Nomenclature*, which will be published on June 28, 1957:

(a) Applications in Part 6 of Volume 13

- (2) *Oeobia* Hubner, [1825]; and its emendation *Oebia*, suppression of (Class Insecta, Order Lepidoptera) (Z.N.(S)1149).

2. Attention is also drawn to the proposed adoption of *Declarations*: (a) clarifying and extending the provisions of the "Code of Ethics" (Z.N.(S) 763); (b) determining the gender to be attributed to generic names having the terminations "-ides", "-ites" and "-oides" (Z.N.(S) 951); (c) clarifying the procedure to be adopted when a specific name is published in an abbreviated form. (Z.N.(S) 1042); (d) clarifying certain problems arising in connection with names published in works written in Latin (Z.N.(S) 1223).

3. The present Notice is given in pursuance of the decisions taken on the recommendation of the International Commission on Zoological Nomenclature, by the Thirteenth International Congress of Zoology, Paris, July 1948 (see *Bull. Zool. Nomencl.* 4:51-56, 57-59; *ibid.* 5:5-13, 131).

4. Any specialist who may desire to comment on any of the foregoing applications is invited to do so in writing to the Secretary to the International Commission (Address: 28 Park Village East, Regent's Park, London N.W.1, England) as soon as possible. Every such comment should be clearly marked with the Commission's File Number as given in the present Notice, and sent in duplicate.

5. If received in sufficient time before the commencement by the International Commission of voting on the application in question, comments received in response to the present Notice will be published in the *Bulletin of Zoological Nomenclature*; comments received too late to be so published will be brought to the attention of the International Commission at the time of the commencement of voting on the application in question.

6. Under the decision by the International Congress of Zoology specified in paragraph 3 above, the period within which comments on the applications covered by the present Notice are receivable is a period of six calendar months calculated from the date of publication of the relevant Part of the *Bulletin of Zoological Nomenclature*. The Parts now in question will be published on June 28, 1957. In consequence any comments on the applications published in these Parts should reach the Secretariat of the International Commission at the latest by December 28, 1957.

FRANCIS HEMMING

Secretary to the International Commission
on Zoological Nomenclature

June 1957.

Notice of proposed use of the Plenary Powers in certain cases for the avoidance of confusion and the validation of current nomenclatorial practice. (A.(n.s.)38)

Notice is hereby given that the possible use by the International Commission on Zoological Nomenclature of its Plenary Powers is involved in applications relating to the under-mentioned names included in Part 8 of Volume 13 and Part 12 of Volume 12 of the *Bulletin of Zoological Nomenclature*, which will be published on August 26, 1957.

(a) Applications in Part 8 of Volume 13

- (3) *padi* Linnaeus, 1758 (*Aphis*), validation of, for the European Bird Cherry Aphid (Class Insecta, Order Hemiptera) (Z.N.(S) 1225).

- (6) *anonyma* Lewis, 1872, (*Limenitis*), suppression of (Class Insecta, Order Lepidoptera) (Z.N.(S) 1180).

2. Attention is also drawn to the proposed adoption of a Declaration clarifying the status of adjectival specific names consisting of partly Latinized words (Z.N.(S)1064).

3. The present Notice is given in pursuance of the decisions taken on the recommendation of the International Commission on Zoological Nomenclature, by the Thirteenth International Congress of Zoology, Paris, July 1948 (see *Bull. Zool. Nomencl.* 4:51-56, 57-59; *ibid.* 5:5-13, 131).

4. Any specialist who may desire to comment on any of the foregoing applications is invited to do so in writing to the Secretary to the International Commission (Address: 28 Park Village East, Regent's Park, London N.W.1, England) as soon as possible. Every such comment should be clearly marked with the Commission's File Number as given in the present Notice, and sent in duplicate.

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6. Under the decision by the International Congress of Zoology specified in paragraph 3 above, the period within which comments on the applications covered by the present Notice are receivable is a period of six calendar months calculated from the date of publication of the relevant Part of the *Bulletin of Zoological Nomenclature*. The Parts now in question will be published on August 26, 1957. In consequence any comments on the applications published in these Parts should reach the Secretariat of the International Commission at the latest by February 26, 1958.

FRANCIS HEMMING

Secretary to the International Commission
on Zoological Nomenclature

August 1957.

FORTHCOMING PUBLICATIONS ON ZOOLOGICAL NOMENCLATURE

The International Trust for Zoological Nomenclature has pleasure in announcing that arrangements have been made for the immediate publication in book-form of the first instalment of each of the "Official Lists" of valid zoological names and of the corresponding "Official Indexes" of rejected and invalid names, together with the first instalments of the "Official Lists" of works approved as available for zoological nomenclature and of the "Official Index" of rejected and invalid works. The categories of names covered by these "Lists" and "Indexes" range from specific names to ordinal names. The total number of entries contained in the instalments now to be published amounts to about five thousand.

The first of these "Lists," that relating to generic names was established by the Ninth International Congress of Zoology, Monaco, 1913, while the most recent were brought into existence by the Fourteenth Congress at Copenhagen in 1953. The entries made on these "Lists" and "Indexes" have been promulgated from time to time by the International Commission on Zoological Nomenclature in individual "Opinions" and "Directions" but owing to the large number of documents so involved it has become increasingly difficult for specialists to ascertain what names have so far been registered under this system. This difficulty will completely disappear on the publication of the instalments now in the press, each of which will be supplied both with a full alphabetical index and also with alphabetical indexes arranged by major groups. The groups so selected will normally be Classes but in the case of large Classes containing well-recognized Orders, these supplementary indexes will be on an ordinal basis.

These "Official Lists" and "Official Indexes" constitute the principal instrument devised to promote stability in zoological nomenclature and will be indispensable to all specialists engaged on taxonomic work in zoology and paleontology.

All inquiries in regard to the above publications should be addressed to the International Trust for Zoological Nomenclature at its Publications Office (41 Queen's Gate, London S.W.7).

FRANCIS HEMMING

*Managing Director and Secretary
International Trust for Zoological Nomenclature
and*

*Secretary to the International Commission
on Zoological Nomenclature*

August 1957.

SPECIAL COMMITTEES

The Membership of the Society's Standing Committees and the list of Society Representatives were published on pages 22 and 23 of the March 1957 BULLETIN. A list of Special Committees appointed by President Armitage was given on pages 2 and 3 of the June 1957 BULLETIN. Two Special Committees completed since that time are given here.

Losses Caused by Insects

W. G. Eden, Auburn, Alabama
J. C. Gaines, College Station, Texas
W. E. McCauley, Scarsdale, New York
Leo G. K. Iverson, Minneapolis, Minnesota
J. E. Swift, Berkeley, California
H. M. Harris, Chairman, Ames, Iowa

Membership in International Union of Pest Control

Walter O. Blank, Poughkeepsie, New York
Maurice Oser, Denver, Colorado
J. J. Davis, Chairman, Lafayette, Indiana

SPECIAL REPRESENTATIVES

C. E. Palm, Ithaca, New York, at the Dedication of the William O. Buettner Memorial Building, National Pest Control Association. At Elizabeth, New Jersey. May 9, 1957.

J. H. Lilly, Ames, Iowa and J. M. Grayson, Blacksburg, Virginia, at the Fourth International Congress of Plant Protection in Hamburg, Germany, September 8-15, 1957.

William E. Bickley, College Park, Maryland, at the Testimonial Dinner for Dr. L. A. Stearns in Dover, Delaware, September 26, 1957.

MEMBERS IN THE NEWS

C. E. Palm, a past-president of the Society, was named Director of the Cornell University Experiment Station and Director of Research for the New York State College of Agriculture and Home Economics on June 1. On June 15, H. H. Schwardt was named Head of the Department of Entomology at Cornell, replacing Dr. Palm.

A. Glenn Richards, of the University of Minnesota, left in September for a year in Europe as a Fulbright Research Scholar at the Max Planck Institut für Biologie at Tübingen, Germany.

George S. Kido was named Director of Western Research by O. M. Scott and Sons in July. His headquarters are in San Francisco. The Wisconsin Alumni Research Foundation announced the appointment of Phillip V. Stone as Director of the Insecticide Division replacing Dr. Kido.

Richard D. Wessell has been appointed Field Research Supervisor—East by the California Spray-Chemical Corporation. He lives in Haddonfield, New Jersey.

At the Honors Awards Ceremony of the U. S. Department of Agriculture on May 21, a Distinguished Service Award was received by S. B. Fracker, of Washington, D. C. Superior Service Awards were made to L. F. Steiner, of Honolulu and Francis Munger of Whittier, California. Forty-year Service Awards were made to B. A. Porter of Beltsville, Maryland, a past-president of the Society, and to M. C. Lane of Walla Walla, Washington.

S. F. Potts, of the U. S. Forest Service at New Haven, Connecticut, and well-known concentrated spray pioneer, retired in July.

Ralph W. Sherman was one of the U. S. D. A. employees who received cash awards in July for beneficial suggestions which saved money in Department activities.

In May, R. H. Carter, U. S. D. A. at Beltsville, received a merit citation from the National Civil Service League in recognition of his outstanding career in the public service.

C. W. Sabrosky, Dipterist at the U. S. National Museum (U. S. D. A.) spent three months this summer in Micronesia. He returned with a nice collection of insects and a full beard.

David A. Young, Homopterist, left the Federal Service for North Carolina State College in May. James P. Kramer from the University of Illinois took Mr. Young's place at the U. S. National Museum.

Sloan E. Jones has been transferred from Brownsville, Texas to Beltsville, Maryland to become Chief of the Field Crop Insects and Bee Culture Research Branch. K. P. Ewing, Head of the Cotton Insects Section at Beltsville, retired in August.

On September 26, a testimonial dinner was held at Dover, Delaware, in honor of L. A. Stearns, retiring October 31 as Head of the Department of Entomology, University of Delaware.

BOOK REVIEWS

GENERAL AND APPLIED ENTOMOLOGY, by V. A. Little, VIII+543 pages, 326 figures. Harper and Brothers, New York, 1957. \$7.00.

A book that balances the scientific and practical approaches to the study of insects on the college level is unusual. Dr. Little has done this admirably. The book should be very practical for use as a text in a general entomology course or for persons wishing a practical but exact treatment of insects. About 70 pages are devoted to an introductory treatment of the anatomy and physiology of insects in general. The 49 figures in this section support the text well. Most of the rest of the book considers the characteristics of each order of insects, the common families and the important species in each. Drawings and pictures, many of them new, illustrate the text.

A feature students appreciate is a glossary. This book has a short one. The bibliography, while not extensive, is up to date and well arranged for the quick location of a more technical treatment of any topic.

Other attractive features of this book are the clear, fairly large type on semi-gloss paper. The illustrations are especially clear and the explanations under them are easy to read. On the whole the book seems to me to meet a need that has existed for some time.

ELIZABETH E. HAVILAND

BIBLIOGRAPHY OF PLANT PROTECTION, 1946-1947. Published by the Biologische Bundesanstalt für Land- und Forstwirtschaft in Berlin-Dahlem. Compiled by Dr. Johannes Bärner, 1957. Paperbound, XLI+460 pp. Obtainable from Verlag Paul Parey, Lindenstrasse 44-47, Berlin SW 68 (West Berlin), Germany. Price DM 44.50.

First issued in 1921 by Prof. Dr. Morstall, this series now includes 22 volumes covering the phytopathological literature for the years 1914-1945, plus three volumes listing similar material from 1946-1947, 1950, and 1951, respectively. The introduction to the latest volume, that for 1946-1947 with 13,800 titles, states that subsequent volumes to close the gap from 1948-1949 will follow shortly. There are approximately 650 titles listed in the 36 pages devoted to Arthropoda.

The 1951 edition was reviewed in the June 1956 Bulletin of the Society. The 1950 and the 1946-1947 editions released since then are of similar scope and format, with titles, introductions, chapter, and title headings conveniently written in English, French, and German.

RALPH W. SHERMAN

HANDBUCH DER PFLANZEN-KRANKHEITEN. Band V, 4. Lieferung. Homoptera II. Teil. Editor Dr. Hans Blunck. Pp. vii+577 with 267 illustrations. Verlag Paul Parey, Berlin und Hamburg, Germany 1957. Price DM 147.

This is volume 1 of a 16 volume set covering the injury of domesticated and useful plants by any plant or animal attacker. This volume refers to the destructive members of the Aphidoidea or plant lice and the Coccoidea or scale insects. The part on plant lice is written by Dr. Carl Börner and Dr. Kurt Heinze and covers pages 1-402, the last 26 of which contains a bibliography of 1648 entries. These are referred to throughout the text. The first 46 pages of the volume deal with the biology of plant lice telling about alternation of generations on different hosts and also what makes winged males and females appear. It also tells of the enormous potential of reproduction by stem mothers. To stop this reproduction it names predators, parasites and tells of

certain diseases, all of which decimate the plant lice. This portion ends with only six pages on control methods but the last four volumes treat with the control of all animals and plants attacking cultivated or useful plants. A systematic treatise of the destructive plant lice of the world is in pages 47-375. There are keys down to species followed by a description of the species with its known distribution, common name, plants it attacks and also its natural enemies. Many fine illustrations are scattered throughout and everything is well documented.

Pages 403-520 cover the scale insects and are written by Dr. Heinrich Schmuttere and Dr. Werner Kloft. The genus *Quadraspidiotus* is worked up by Dr. Manfred Luedicke. The first 13 pages are general and cover biology and control followed by a page of bibliography. Then the systematic study of scale insects is taken up with keys and many illustrations with extensive bibliography at the end of each family. Everything is well documented as in the previous part. The book ends with four pages of glossary which are of great help.

The index which is complete for the insects covered in the book as well as for the plants is on pages 525-577. This is an invaluable help in using the book if one wants to look up the world distribution of a pest plant louse or scale and find out what others have written about it. The book is an excellent reference work for entomologists in this country and is well illustrated and species can be found quickly. Common names are given under each species and many of these are in the index. Also the keys are very good and the entomologist can key down his specimen, if he has a little knowledge of German.

HENRY DIETRICH

HISTORY OF ENTOMOLOGY IN WORLD WAR II, by Emory C. Cushing. Smithsonian Institution Publication 4294, pp. i-vi; 1-117, 1957. \$2.00.

Because it is essentially an account of the part played by entomologists toward the successful conclusion of the last great war, this work deals primarily with medical entomology and emphasizes the development and application of measures for the control of such pests as mosquitoes, sand flies, lice, fleas and mites under conditions encountered in military operations. It is brought out clearly that the successes achieved were the result of close cooperative effort on the part of the U. S. Bureau of Entomology and Plant Quarantine and industrial entomologists, on the one hand, and the medical departments of the Army and Navy, on the other. Even with the natural emphasis on control procedures, the significance of taxonomic and biological studies, particularly in connection with the fight against the many different species of mosquitoes involved, is given very fair coverage, although perhaps not enough is said about the valuable taxonomic work that was done in the field by Army and Navy entomologists, sometimes under very trying conditions. There is also brief but adequate consideration of the work of "entomologists on the home front" during the War, with some detailing of adjustments made necessary by insecticide shortages and by critical shortages of manpower. And, finally, there is an informative table summarizing the numbers of cases of the various insect- and mite-borne diseases among Army personnel during the War.

It is unfortunate that here and there statements, presented as accepted facts although certainly disputable if not clearly in error, were allowed to creep in. For example: (p. 1) that there were 2,000,000 insect species in existence several millenia before the last congener of *Homo sapiens* passed away is a

rather wild guess; (p. 9) that the "Great American Desert" resulted from periodic invasions of grasshoppers again is merely a guess and probably a poor one; (p. 45) that *Anopheles albimanus* is the major vector of malaria in Texas is at least misleading since the species is known to occur only in limited numbers in the vicinity of Brownsville; and (p. 111) that our political leaders "steered us to the highway of world-wide conflict" is a most regrettable statement in a work of this kind. Throughout the book, moreover, there is a tendency to endow insects and pathogens with human qualities, which detracts from a contribution that professes to be a presentation of facts.

In the main, however, these are minor faults. In spite of them, and despite also the unfortunately late appearance of the work, more than ten years after the end of the War, this interesting and readable publication is a valuable record of the importance of insect pests in military operations, and of the persistent and resourceful efforts of entomologists to deal quickly and simultaneously with many new and serious problems in widely separated parts of the world.

C. F. W. MUESEBECK

OXYUROID PARASITES OF ARTHROPODA. A monographic study. 1. Thelastomatidae; 2. Oxyuridae. By M. A. Basir, Aligarh Muslim Univ., U. P., India. Zoologica, Bd. 38, Lief. 2, Heft 106, pp. 1-79, 13 pls. Stuttgart. 1956. (37.1 cm., unbound) Price not stated.

This work on parasitic nematodes, published in English, includes a complete revision of the Thelastomatidae, comprising 26 genera and about 80 recognized species, which have been recorded from millepedes, diplopods, beetles, mole crickets, field crickets, the larvae of crane flies, and especially cockroaches. This family is world-wide, and only one species has been recorded from a vertebrate host. The Oxyuridae here treated are only those parasitic on arthropods, consisting of 4 genera and 4 species. One record from an opossum is described as perhaps due to a parasitized mole cricket having been eaten. Mole crickets and millepedes are the usual hosts. In both families, previous classifications have been rather at variance, so that the present ones are important contributions. All species are described, and data are presented on hosts, location of the parasite within the host, and geographic distribution. Most of the species are illustrated. There are an index and lists of references.

ASHLEY B. GURNEY

ENTOMOLOGY AT THE UNIVERSITY OF DELAWARE, by L. A. Stearns.

This historical summary (a 46-page typed manuscript), listing administrative personnel in entomology and discussing briefly the situation during their respective periods of employment, covers the entire 69 years which have now elapsed since the establishment of this section. It will be published in the next issue (late fall, 1957) of *DELAWARE NOTES*, a faculty publication, and reprints will be available for those interested.

The purpose of this paper is three-fold: first, to review and evaluate the endeavors of the early group (M. H. Beckwith, G. Harold Powell, E. Dwight Sanderson and C. O. Houghton—1888 through 1907), thus provide a convenient reference on their noteworthy contributions; second, to consider happenings from 1908 to 1925, when entomological work in this

state was at a standstill; and, third, to give a factual account only of developments (under H. L. Dozier and L. A. Stearns) from 1926 through 1957.

The entomological program from 1888 to late in 1929 suffered deplorably from frequent changes in its direction, and even more, from a lack of continuity. Only since 1930 has there been an almost uninterrupted, gradually-expanding effort in this field, largely attributable to constant and substantial financial support from extra-University sources. Research accomplishments from 1888 to date are set forth in 289 publications.

CONTINUOUS MASS REARING OF THE EUROPEAN CORN BORER IN THE LABORATORY, by Paul Surany. 12 pages, 7 figures. Illinois Natural History Survey, Biological Notes No. 37.

This new publication explains the laboratory procedure for rearing of numbers of European corn borers in all stages of development for year-round research. It includes exact descriptions of rearing equipment. Also it suggests ways in which rearing methods developed for the corn borer can be adapted for use with potato leafhopper, corn earworm, variegated cutworm, and armyworm, and describes equipment and techniques used in testing insecticides and pathogens against the corn borer.

Single copies of the publication are available free on request. Quantity orders are a subject for correspondence.

H. B. MILLS

THE PESTICIDE SITUATION FOR 1956-57. Prepared by H. H. Shepard, Commodity Stabilization Service, Food and Materials Requirements Division, U.S.D.A., Washington, D. C. 19 pp. April, 1957.

Very useful statistical information on the major pesticidal chemicals.

R. H. N.

PEST INFESTATION RESEARCH 1956. 64 pp. Order from British Information Services, 45 Rockefeller Plaza, New York 20, N. Y. 86¢ postpaid. 1957.

This is the report of the Pest Infestation Research Board with the report of the director of Pest Infestation Research, Department of Scientific and Industrial Research, England. Main chapter headings of research reported are: Biology, Grain Storage and Microbiology, Insecticides, Fumigants and Biochemistry.

R. H. N.

NEW PUBLICATIONS

SOIL—THE 1957 YEARBOOK OF AGRICULTURE U. S. Department of Agriculture. XIII+784 pp. For sale by the Superintendent of Documents, Washington 25, D. C. \$2.25.

PLANT DOCTORING IS FUN by Cynthia Wescott. D. Van Nostrand Company, Inc., Princeton, N. Y. VIII+280 pp. \$4.50.

CROP PESTS AND HOW TO FIGHT THEM. Prepared in collaboration with the Department of Agriculture, Bombay State and first published August, 1956, by the Directorate of Publicity, Government of Bombay, Bombay, India. 204 pp. 4 colored plates. Price Rs. 2.

VERTEBRATES OF THE UNITED STATES by W. Frank Blair, Albert P. Blair, Pierce Brodtkorb, Fred R. Cagle, and George A. Moore. McGraw-Hill Book Company, Inc., New York, N. Y. IX+819 pp. 426 figs. \$12.00.

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